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A

DICTIONARY

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PRACTICAL SURGERY,

CONTAINING

A COMPLETE EXHIBITION OF THE PRESENT STATE

OF THE

PRINCIPLES AND PRACTICE

OF

SURGERY,

COLLECTED FROM THE BEST AND MOST ORIGINAL SOURCES OF
INFORMATION,

AND ILLUSTRATED BY CRITICAL REMARKS.

BY SAMUEL COOPER,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS, LONDON, AND AUTHOR OF THE
"FIRST LINES OF THE PRACTICE OF SURGERY."

WITH NOTES AND ADDITIONS,

BY JOHN SYNG DORSEY, M. D.

ADJUNCT PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA, &c

IN TWO VOLUMES.

VOL. I.

SECOND AMERICAN, FROM AN ENLARGED LONDON EDITION.

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PUBLISHED BY B. & T. KITE, JOHNSON & WARNER, M. CAREY, I. PIERCE, S. W. CONRAD,
B. C. BUZBY, E. PARKER, AND A. SMALL.

1816.

DISTRICT OF PENNSYLVANIA, TO WIT:

L. S.

BE IT REMEMBERED, That on the first day of January, in the fortieth year of the Independence of the United States of America, A. D. 1816. BENJAMIN AND THOMAS KITE, of the said district, have deposited in this office the Title of a Book, the right whereof they claim as Proprietors, in the words following, to wit:

"A Dictionary of Practical Surgery, containing a complete Exhibition of the present State of the Principles and Practice of Surgery, collected from the best and most original sources of information, and illustrated by critical remarks. By Samuel Cooper, Member of the Royal College of Surgeons, London, and author of the "First Lines of the Practice of Surgery." With notes and additions, by John Syng Dorsey, M. D. Adjunct Professor of Surgery in the University of Pennsylvania, &c. In two volumes. Vol. I. Second American, from the London second edition."

In conformity to the act of the Congress of the United States, entitled "An Act for the Encouragement of learning, by securing the Copies of Maps, Charts, and Books, to the Authors and Proprietors of such Copies during the times therein mentioned." And also to the Act, entitled "An Act supplementary to an Act, entitled "An Act for the Encouragement of Learning, by securing the Copies of Maps, Charts, and Books, to the Authors and Proprietors of such Copies during the time therein mentioned," and extending the Benefits thereof to the Arts of designing, engraving, and etching historical and other Prints."

D. CALDWELL,
Clerk of the District of Pennsylvania.

ADVERTISEMENT.

THE American Editor begs leave to prefix a few remarks to this edition. He was induced to republish the first edition, from a conviction, that he would render an important service to his fellow practitioners throughout the United States, by placing within their reach, a mass of Surgical knowledge, greater than had been ever before, condensed into so small a compass. That he was not greatly mistaken in his estimate of the work, has been rendered highly probable by the rapid sale of a large edition, and by the concurrent approbation of many distinguished Surgeons throughout the extensive territories of the United States.

THE second London edition, from which this edition is reprinted, has been greatly enlarged by the Author, by copious extracts from most of the recent publications on Surgery.

THE American Editor has retained, in the present edition, the notes published in the first, and has added others, which he trusts will be found of sufficient interest to justify their insertion. He is conscious that he can hope to derive neither literary nor professional reputation from the task he has undertaken, but in ushering into the world a book, containing the united wisdom of the most eminent writers on Surgery, he has at least one satisfaction, that of promoting the best interests of his profession.

January 1, 1816.

A DICTIONARY

OF

PRACTICAL SURGERY.

A B A

A BANET. A bandage resembling a girdle.

ABAPTISTON, or ABAPTISTA (from *ἀ* priv. and *βάπτω*, *immergo*, to sink under.) Galen, Fabricius ab Aquapendente, and especially Scultetus, in his *Armamentarium Chirurgicum*, so denominate the crown of the trepan; or, in other words, the circular saw which makes the perforation in the bone, when the instrument is used. The term came into use, in consequence of this part of the trepan having had, at its first invention, a conical form, which kept it from penetrating the cranium too rapidly, so as to plunge the teeth of the saw in the dura mater and brain.—*Encyclopédie Méthodique; Partie Chirurgicale, art. Abaptiston.*

Whatever suppositious advantages the ancient practitioners of surgery may have imputed to the conical shape of the crowns of their trepans, certain it is, that modern surgeons do not, in general, adopt their notions on this subject; but, almost universally, make use of a circular saw, the figure of which is simply cylindrical.

Mr. Samuel Sharp notices the idea of there being the above danger in employing a cylindrical trepan, and remarks, that the great labour of working so slowly and difficultly (with a conical one) is not only very inconvenient to an operator, but by no means serviceable to the operation; for, notwithstanding the saw be cylindrical, and work without any other impediment than what lies before the teeth, yet, even with this advantage, the operation goes on so gradually, that, in all the experience which Mr. Sharp has had, he never found the least danger of suddenly passing through to the brain, if care be taken not to lean too hard on the instrument when the bone is almost sawn through. With respect to the impracticableness of inclining the cylindrical saw on any particular

A B D

part of the circle, when sawn unevenly, (which was formerly alleged) whoever will try the experiment, will, in a moment, discover the falseness of the assertion. The very instance stated overthrows this reasoning; for, if the circle has already been made more deeply in one part than another, it must imply, that we have leaned with more force on one part than another, and, consequently, may at pleasure do the same thing again. Mr. Sharp next takes notice of the supposed advantage, which the conical saw had in receiving and retaining the piece of bone; a circumstance, which he, very properly, calls frivolous.

Sharp on the Operations of Surgery.

ABDOMEN. The **BELLY.** The term is said to be derived from the Latin verb *abdo*, to hide, because many of the chief viscera of the body are concealed in the cavity, which it denotes.

When a surgeon speaks of the cavity of the abdomen, he confines his meaning to the space, which is included within the bag of the peritoneum. Hence, neither the kidneys, nor the pelvic viscera, are, strictly speaking, parts of the abdomen.

Anatomists have distinguished this large cavity into different regions, and the terms, allotted to these, are so very frequent in the language of surgical books, that some account of them in this Dictionary seems indispensable.

The middle of the upper part of the abdomen, from the ensiform cartilage, as low down as a line drawn across from the greatest convexity of the cartilages of the ribs, is called the *epigastric region*.

The spaces at the sides of the epigastric region are termed, the *right* and *left hypochondria*, or *hypochondriac regions*.

The *umbilical region* extends upward to the line, forming the lower boundary of the epigastric region, and downward, to a

line drawn across from one anterior superior spinous process of the ilium to the other.

All below the last line, down to the os pubis, is named the *hypogastric region*.

The abdomen is a part of the body claiming the particular attention of every practical surgeon; for, it is the frequent situation of several of the most important surgical diseases. It is also very much exposed to wounds, and various operations are often requisite to be done in different parts of it. One of the most common afflictions, to which mankind are subject, is that in which some of the bowels are protruded, pushing out before them a portion of the peritoneum. This disease is called *hernia*, and ought to be well understood by every practitioner who, however, can never acquire the necessary knowledge, without being well acquainted with the anatomy of the abdomen. In dropsical cases, it is frequently proper to tap the abdomen, and this operation, named *paracentesis*, simple as it may seem, requires more consideration, and attention to anatomy, than surgeons often bestow on the subject. But the abdomen is, above all things, exceedingly liable to be wounded, to which case we shall confine our present remarks, referring the reader to *Hernia* and *Paracentesis* for information on these particular subjects.

WOUNDS OF THE ABDOMEN.

In these cases, we find that the chief cause of danger is the tendency of the peritoneum to inflame. Every wound of the belly is apt to excite this inflammation, and every inflammation, however slight, is prone to spread, to extend itself over all the viscera, and to terminate in gangrene and death.

There are (says Mr. John Bell) a thousand occasions, on which this delicacy of the peritoneum may be observed; the wound of the small sword, and the stab of the stiletto, explain to us, how quickly the peritoneum, and all its contained bowels, inflame from the most minute wound, although it be almost too small to be visible on the outside, and scarcely within; for, often, upon dissection, no intestines are seen to be wounded, and no feces have escaped into the abdomen. In those, who die after lithotomy, we find the cavity of the peritoneum universally inflamed. The operation of Cæsarean section is fatal, not from any loss of blood, for there is little bleeding; nor, from the parts being exposed to the air, for, patients also die, in whom the womb bursts, and where the air has no possible opportunity of insinuating itself; but, the case proves fatal from the

inflammation, which is always disposed to originate from wounds of the peritoneum, small as well as great. (*Discourses on the Nature and Cure of Wounds*, p. 310, edit. 3.)

But, although there can be no doubt, that the wound, abstractedly considered, is the most frequent occasion of this dreaded inflammation; yet, it sometimes happens, that the inflammatory consequences must be ascribed to another kind of cause. If an intestine be wounded, its contents may, under certain circumstances, be effused in the abdomen; if the liver, spleen, kidney, or any large vessel be injured, blood may be poured out among the viscera; if the gall bladder be wounded, bile may be effused; and, if the bladder be pierced, the urine may escape into the abdomen. Now all these extravasated fluids are extraneous substances, with respect to the surfaces, with which they have come into contact, and usually give rise to inflammation of the peritoneum and viscera. I must not, however, prematurely allude to subjects, which will more properly fall under future consideration.

Wounds of the abdomen are divided, by almost all writers, into such as penetrate the cavity of the abdomen, and into others, which only interest the skin and muscles.

The former differ very much in their nature, and degree of danger, according as they do, or do not, injure parts of importance, contained in the peritoneum. The latter are not very different from the generality of other superficial wounds. The chief indications are to lower inflammation, and to prevent collections of matter. A few particularities, however, in the treatment of superficial wounds of the abdomen, seem to merit attention.

SUPERFICIAL WOUNDS.

The most ancient surgeons, and their successors, regularly up to the present day, have recorded, that wounds of tendinous parts are more perilous, than those of fleshy ones. Almost the whole front of the abdomen is covered with tendinous expansions, and, on this account, it is not unusual to see wounds in this situation followed by great local inflammations, and the formation of abscesses. The patient is, at the same time, affected with a great deal of the sympathetic inflammatory fever. (See *Fever*.) When the tension and swelling of the abdomen abate, shiverings sometimes occur, and indicate the occurrence of suppuration.

The matter, which forms in these cases, sometimes makes its way into the tendinous sheath of the rectus muscle, and, when the collection of matter in this situation remains undiscovered until a pointing ap-

pers, no sooner does the abscess burst or is it opened, than an extraordinary quantity of matter is discharged. The surgeon should carefully remember the nature of this kind of case, as there is frequently no alteration in the appearance of the integuments to denote, either the existence, or the extent, of the suppuration.

This kind of abscess forms one remarkable exception to the excellent general rule of allowing acute phlegmonous abscesses to burst of their own accord. In the present instance, there is an aponeurotic expansion, intervening between the abscess and the skin, and nothing retards the natural progress of the matter to the surface of the body so powerfully, as the interposition of a tendinous fascia. But, even in this circumstance, the propensity of pus to make its way outward is often seen to have immense influence. Though there is only a thin membrane, (viz. the peritoneum) between matter so situated, and the cavity of the abdomen, yet, in time, the abscess mostly points externally.

The proper treatment of this case is to prevent the surprising accumulation of matter, and rapid increase of mischief, by making a depending opening, sometimes at the very lowest part of the sheath of the rectus muscle, and this, as soon as the lodgment of matter is clearly ascertained.

The matter sometimes forms between the external and internal oblique muscles, and spreads most extensively. The pus may even insinuate itself into the abdomen, and the case end fatally. Such an example is recorded by Dr. Crowther, of Wakefield. In this instance, however, the disease proceeded from a contusion, not a wound. (See *Edinb. Med. and Surgical Journal*, vol. ii. p. 129.)

Superficial wounds of the abdomen are to be treated on the same principles, as similar wounds in other situations. The indications are to prevent inflammation as much as possible, and, if suppuration should be inevitable, to let out the matter by a depending opening, as soon as the abscess is known to exist. The inflammation is to be checked by general and topical bleeding, low diet, emollient clysters, diluent beverages, quietude, and the mildest, and most simple dressings. (See *Inflammation*.)

Whenever the abdominal muscles are wounded, it is desirable to relax them; but, this object should not lead us to put the patient out of a horizontal position. A very important point, in the treatment of wounds, which interest the parietes of the abdomen, is to afford a certain degree of support to the wounded part, when there seems the smallest chance of their being too weak to resist the pressure of the vis-

cera. The parietes of the abdomen are almost wholly composed of soft parts, which easily yield. No part of the front, or sides, of the abdomen, is supported by the stability of a bony structure, and, as the viscera are, for the most part, more or less moveable, and closely compressed by the abdominal muscles, and diaphragm, they are extremely liable to be protruded, whenever the resistance of the parietes of the abdomen is not sufficiently potent. Thus very perilous cases of hernia may originate.

For the above reasons, all wounds of the abdomen, especially those, in which both the integuments and muscles have been cut, demand strict attention to the precaution of supporting the wounded part, and this, though the peritoneum itself should not happen to be divided. The patient ought to keep as much as possible in a horizontal position, while suitable compresses and bandages should be applied to the situation of the wound. In order to guard against the occurrence of hernia, the part should be supported, in this way, a considerable time after the wound is healed.

The peritoneum being connected by means of cellular substance, with the inner surface of the abdominal muscles, there is always some risk of the inflammation of these muscles extending to the membranous lining of the abdomen. This occurrence must be averted by the rigorous employment of the antiphlogistic treatment. What renders the event still more dangerous is, that when one point of the peritoneum is affected, the inflammation usually spreads with immense rapidity over its whole extent, and too often proves fatal.

As superficial wounds of the abdomen are to be treated on the general principles, applicable to all other wounds of this sort in other situations, it is hardly necessary to state, that union by the first intention is always, when possible, to be attempted.

OF WOUNDS PENETRATING THE CAVITY OF THE ABDOMEN.

In these cases, the first thing, which the surgeon is generally anxious to know, is, whether the wound penetrates the cavity of the abdomen, and whether any of the viscera are probably injured.

When the wound is extensive, and any of the bowels protrude, the first part of the question is at once decided. But, when the wound is narrow, and allows none of the viscera to protrude, it is often exceedingly difficult to ascertain, whether the injury extends into the abdomen, or not.

An opinion, however, may usually be formed, by carefully examining the wound with one of the fingers, or a probe, after having put the patient, as exactly as possible, in the posture in which he was at the time of receiving the accident; by observing, if possible, the shape and dimensions of the instrument, with which the injury was done; how much of the weapon has entered the flesh; the direction in which it was pushed; by attending to the quantity of blood, which the patient has lost, the state of his pulse, &c. and, lastly, by observing, whether there is any discharge of bile, feces, or other fluids, known to be naturally contained in some of the abdominal viscera.

When the wound is sufficiently large to admit the finger, we may always ascertain whether the injury extends into the cavity of the abdomen, because the viscera may then be easily felt. There is only one chance of deception, and that arises from a possibility of the practitioner's mistaking the inside of the sheath of the rectus muscle for the cavity of the peritoneum. When the examination is made with a probe, we should be particularly cautious in forming a judgment; for, the parts are so soft and yielding, that a very little force will make the instrument pass a considerable way inward. Every examination of this kind should always be undertaken, if possible, when the patient is exactly in the same position, as he was at the time of receiving the wound.

Injectations have been employed for ascertaining, whether wounds penetrate the cavity of the abdomen. This absurd experiment, however, has now been most justly exploded from practice. It is well known to the moderns, that the space termed the cavity of the abdomen, is in fact, completely filled with the various viscera, and that a fluid would, in general, not so easily find its way into the bag of the peritoneum, as an unreflecting person might suppose. If the injection were propelled with much force, it would be quite as likely to insinuate itself into the cellular substance of the parietes of the abdomen, or, perhaps, into the sheath of the rectus muscle. The least tortuosity of the wound, or a piece of bowel, or omentum, lying against the internal orifice of the injury, would completely prevent an injection from passing into the abdomen.

When a considerable quantity of blood issues from a wound of the abdomen, we may pronounce, almost with certainty, that some large vessel, within its cavity, is injured. Excepting the epigastric artery, which runs on the forepart of the abdomen, along the inner surface of the rectus muscle, there is not one very considerable ves-

sel, distributed to the muscles, and integuments. At the same time, it is deserving of particular notice, that a very large artery may be opened in the abdomen, and, yet, not a drop of blood may be discharged from the external wound. A copious quantity may accumulate in this manner, even without there being any palpable swelling of the belly.

In such cases, the subsequent symptoms very quickly lead us to suspect what has happened. The patient complains of extreme debility and faintness; his pulse falters; he has cold sweats; and, if the bleeding should not speedily cease, these symptoms are, in general, soon followed by death.

Sometimes, the first glimpse is enough to shew, that the wound extends into the cavity of the abdomen. The event is indicated by the escape of chyle, bilious matter, feces, or other fluids, known to be contained in some of the viscera. The same information may also be obtained from seeing a considerable quantity of blood vomited up, or discharged by stool. The urine, however, may flow from a wound, which does not actually penetrate the abdomen, for the kidneys, ureter, and bladder may be said to be out of the abdomen, because they are really on the outside of the cavity of the peritoneum.

When no symptoms of the above description occur, when neither the finger, nor probe, can be introduced; when none of the fluids, known to be contained in the various receptacles in the abdomen, are emitted from the wound; when the pulse remains natural, and the pain is not excessive; there is reason to hope, that the wound has not injured parts of greater consequence than the integuments, and muscles. (*Encyclopédie Méthodique, Partie Chirurgicale. Art. Abdomen*)

We have now taken a survey of such criteria, as are commonly noticed by surgical writers, for the purpose of instructing the reader how to discriminate a wound which has penetrated the abdomen, from one which has not. It is our next place to warn the practitioner, that too much solicitude to determine this point, is very frequently productive of serious harm. It may be set down, as an axiom in surgery, that, *whenever the probing of a wound is not rendered absolutely necessary by some particular object in view, it may, in general, be judiciously omitted.* A narrow, oblique wound may enter the cavity of the abdomen, without there being any particular method of ascertaining, whether it has done so, or not. This, however, is of no practical importance; for, when there are no urgent symptoms, evincing the nature of the case, the treatment ought obviously to resemble that

of a simple wound; and whether the wound is deep, or superficial, the antiphlogistic treatment is equally indicated.

The edges of a wound penetrating the abdomen, but, unattended with any obvious injury of the viscera, are to be brought together with a sticking-plaster, just in the same way as common wounds. In this situation, sutures are more frequently proper, than in most others. Particular care is also to be taken to keep the bowels from protruding, by the application of a compress, and bandage. All the means of preventing inflammation are to be adopted, (see *Inflammation*) and quietude is, above all things, to be enjoined.

Our good old surgeon Wiseman (observes Mr. John Bell) has said with great simplicity, as a great many have said after him, "Thus it frequently happeneth, that a sword passeth through the body, without wounding any considerable part." He means, that a rapier, or ball often passes quite across the belly, in at the navel, and out at the back, and that without one bad sign, the patient recovers, and as has very often happened, walks abroad in good health, in eight days; which speedy cure has been supposed to imply a simple wound, in which all the bowels have escaped. But, we see now, *how* this is to be explained; for, we know, that in a thrust across the abdomen, six turns of intestine may be wounded,—each wound may adhere; adhesion, we know, is begun in a few hours, and is perfected in a few days; and, when it is perfect, all danger of inflammation is over; and, when the danger of inflammation is over, the patient may walk abroad; so that we may do, just as old Wiseman did in this case, here alluded to,* "Bleed him, and advise him to keep his bed, and be quiet." In short, a man, thus wounded, if he be kept low, has his chance of escaping by an adhesion of the internal wounds." (*Discourses on the Nature and Cure of Wounds*, p. 329, 330, edit 3.)

When a man is stabbed, or shot in the belly, the surgeon can seldom do any good by being very officious; and the wisest conduct, that he can in general adopt, is to keep his patient as quiet as possible, have recourse to bleeding, prescribe anodynes, and the lowest fluid diet, and content himself with applying superficial dressings. In the event of severe pain and swelling of the belly coming on, leeches, fomentations, and emollient poultices will be necessary, and nothing will

now avail, except the most rigorous antiphlogistic means.

INFLAMMATORY CONSEQUENCES OF WOUNDS OF THE ABDOMEN.

Sometimes, notwithstanding the best treatment, alarming symptoms cannot be prevented. At first, these are commonly of the inflammatory kind; consequently, repeated bleeding, and redoubled attention to every part of the antiphlogistic treatment, are indicated. If the inflammation should not be subdued by such measures, internal mortification and death may follow, or abscesses form in the abdomen.

SUPPURATION IN THE ABDOMEN, IN CONSEQUENCE OF WOUNDS.

Abscesses within the bag of the peritoneum are far from being common occurrences. As a late writer well observes, "the containing and contained parts of the abdomen present to each other a uniform and continuous surface of membrane. This membrane is of the serous class, and the species of inflammation, to which it is especially subject, is that, which has been denominated the adhesive. The membrane lining the intestinal canal, is of the mucous class, and the ulcerative inflammation is the species, to which this class is liable. This beneficent provision is an irresistible evidence of the operation of a salutary principle in disease. If the inflamed peritoneum had run directly into suppuration, ulceration of the surrounding parts would have been required for an outlet; and if the internal surface of the irritated bowel had tended to form adhesions, the canal would have been in constant danger of obliteration." (*Travers on Injuries of the Intestines, &c.* p. 10.)

That collections of matter, however, do sometimes take place in the cavity of the abdomen, in consequence of wounds, is a fact of which there are too many proofs on record, for the possibility of the case to be doubted. At this moment, be it sufficient for our purpose to refer to two examples of the occurrence, as related by Mr. Benjamin Bell, in his *System of Surgery*, vol. v. p. 256.

If the abscess were in any other part of the body, and did not readily point, the wisest practice would undoubtedly be to make an opening sufficient for the evacuation of the matter. But suppuration in the abdomen can seldom be ascertained with certainty, before the collection of matter has existed a good while; for, the situation of the abscess is so deep, that no fluctuation, nor swelling, becomes perceptible, until a considerable quantity of pus has accumu-

* P. 98. The case of a man, who was wounded across the belly, and well and abroad, in seven days.

lated. Besides, it would not be judicious to expose the patient to the hazard, which might arise from making an opening, into the abdomen, merely for the sake of giving vent to a small collection of matter.

Many, indeed almost all writers, impute a vast deal of the danger of wounds of the abdomen to the entrance of air into the cavity of the peritoneum, and they also adduce this as an argument against opening abscesses of the abdomen. In inculcating such opinions, however, they betray an inaccuracy of observation, which a very little reflection would have set right. Too much stress has long been laid on the introduction of air into the abdomen, as being a cause of inflammation. The fact is, that the cavity of the belly is always so completely occupied by the various viscera, that the whole inner surface of the peritoneum is constantly in close contact with them, and, consequently air cannot so easily diffuse itself from the vicinity of the wound, throughout the abdomen, as has been conceived. After tapping, in dropsical cases, we seldom see inflammation arise, though air has, in this instance, quite as good an opportunity of entering the abdomen, as in any case of a wound. The peritoneum in animals has been inflated, without any inflammation being excited. In cases of tympanitis, the peritoneum is distended with air, and yet both this membrane and the bowels are quite uninfamed. In the human subject, it seems probable, that, if a wound were made in a vacuum, the breach of continuity itself would lead to inflammatory consequences. We have also to remark, that collections of matter in the abdomen are almost always completely circumscribed, and separated from the general cavity of the peritoneum, by the adhesion of the viscera to each other, and to the inside of the peritoneum.

I am of opinion, that no surgical writer has succeeded so well, as Mr. John Bell, in exposing the absurd apprehensions, not uncommonly entertained by practitioners, respecting the entrance of air into the abdomen and other cavities of the body. He enquires: 1st, Whether air can really get into the cavity of the abdomen? and 2dly, Whether, if it were there, it would produce the dreadful effects ascribed to it?

Upon the first question, his arguments run thus: "Suppose a wound of an inch in length;—suppose the bowel to have sunk, in some strange way, into the pelvis, for example, so as to have left a mere vacuum; what should happen with the flexible parietes of the abdomen? Should they stand rigid, while the air rushed into the cavity to fill it? No, surely. But, on the contrary, the walls of the abdomen

would fall together, and the pressure of the outward air, far from making the air rush in by the outward wound, would, at once, lay the belly flat, and close the wound. But, since the walls of the abdomen are not flaccid, nor the cavity empty, but the abdomen full, and the flat muscles, which cover it, acting strongly, the effect must be much more particular; for, the moment that the belly is wounded, the action of the muscles will force out part of the bowels: the continuance of that action is necessary to respiration; the respiration continues as regular after the wound, as before; and the continual pressure of the abdominal muscles and the diaphragm, against all the viscera of the abdomen, prevents the access of air so effectually, that, though we should hold such a wound open with our fingers, no air could pass into the abdomen, further than to that piece of gut which is first touched with the finger, when we thrust it into the abdomen. Nothing is absolutely exposed to the air, except that piece of intestine, which is without the abdomen, or that, which we see, when we expose a small piece of the bowels, by holding aside the lips of the wound. The pressing forward of that piece, and the protrusion of a portion of the gut, proportioned always to the size of the wound; the pressure from behind keeping that piece protruded, so that it is with difficulty, we can push it back with our finger; this incessant pressure, in all directions, is an absolute security against the access of air. The intestine comes out, not like water out of a bottle, the place of which must be supplied by air entering into the bottle, in proportion as the water comes out; but, the gut is pushed down by the action of the muscular walls of the abdomen, and that action follows the intestine, and keeps it down, and prevents all access of the air whether the gut continue thus protruding, or whether it be reduced; for, if it be reduced, the walls of the abdomen yield, allowing it to be thrust back, but admitting no air. Those, who want to know the effect of air, diffused within the cavity of the abdomen, must make other experiments, than merely cutting open pigs' bellies;—they must give us a fair case, without this unnecessary wound. We will not allow them to say, when they cut open the belly of any creature, with a long incision, that the inflammation arises from the air: much less shall we allow them to say, when they open the belly with a smaller incision, that, by that little incision, the air gets into the abdomen, and that all the bowels are exposed to the air." (*Discourses on the Nature and Cure of Wounds*, p. 333, 334.)

In adverting to the question, whether

air is so irritating to the cavities of the body, as many have supposed, Mr. John Bell criticises, with much spirit and success, the opinions, published on this subject, by Dr. A. Monro, in his account of the *Bursæ Mucosæ*, as the annexed quotations will shew. "That the vulgar should believe, the first superficial impression that strikes them, of air hurting a wound or sore, is by no means surprising; but, it is not natural, that men, bred to philosophy, should allow so strange an assertion as this, without some kind of proof. That the air, which we breathe, and which we feel upon the surface so bland and delightful, should have so opposite a relation to the internal parts, that it should there be a stimulus, more acrid and more dangerous, than the urine, is not to be believed upon slight grounds. I do affirm, (says Mr. John Bell) that it remains to be proved, that this fluid, which seems so bland and pleasant to all our senses, and to the outward surface, is yet a horrible stimulus, when admitted, as a celebrated author grandly expresses it, "into the deep recesses of our body." (*Monro's Bursæ Mucosæ*.)

With how much reason, Mr. John Bell objects, that this doctrine is founded, will be manifest to every man of any discernment, or impartiality.

"The air, for instance, escapes from the lungs, in a fractured rib, and first goes abroad into the thorax; then into the cellular substance; then the emphysematous tumour appears; but, often, without any scarifications, with very little care and assistance on our part, the air is absorbed, the tumour disappears, and, without inflammation of the chest, or any particular danger, the man gets well. Here then is the air, within the cavity of a shut sac, filling the thorax, and oppressing the lungs, without any dangerous inflammation ensuing.

"That the air may be pushed, under the cellular substance over all the body, without causing inflammation, is very plain from the more desperate cases of emphysema, where the patients, after living eight or ten days, have died, not from inflammation, but, from oppression merely, the body being so crammed with air, that even the eye-balls have, upon dissection, been found as tense as blown bladders. We have also many ludicrous cases of this kind, which prove this to our perfect satisfaction. Soldiers, and sailors, sometimes touch the scrotum with a lancet, introduce a blow-pipe, and blow it up to an enormous size, imitating herniæ, by which they hope to escape from the service. The old story of a man, who was so wicked as to make a hole in his child's head, and

blow it up, that he might shew the child in the streets of Paris for a monster, is well authenticated; and, I have little doubt, that a fellow, who knew how to do this, would blow it up every morning, and squeeze it out when he put the child to bed at night. Some villainous butchers, having a grudge at a soldier, found him lying drunk, under a hedge; they made a little hole in his neck, and blew him up, till he was like a bladder, or, as Dr. Hunter describes the disease of emphysema, *like a stuffed skin.*" (P. 338, 339)

After many other pertinent observations, blended with appropriate satyr, on the extravagant notions professed by Monro on the bad effects of the air, in lithotomy, operations for hernia, and hydrocele, the Cæsarean section, &c., Mr. John Bell most justly holds up to ridicule the propositions of Dr. Aitken to perform this last operation under the cover of a warm bath in order to exclude the air. "This, though it may seem to be a scurvy piece of wit, was really proposed in sober serious earnest. But (adds Mr. John Bell), the admission of atmospheric air, as a stimulus, when compared with the great incisions of lithotomy, of hernia, of hydrocele, of Cæsarean section, of the trepan, is no more, than the drop of the bucket to the waters of the ocean. And it is just as poor logic to say, that, after such desperate operations, these cavities are inflamed by the admission of air, as it would be to say, (as Monro did) that when a man is run through the pericardium with a red hot poker, that the heart and pericardium are inflamed by the admission of the air." (P. 347, *edit. 3.*)

Enough, I conceive, has been said, to dispel all the idle fear and prejudices which have prevailed concerning the bad effects of the air in wounds of the abdomen, as well as several other cases. When so justly eminent a man as Dr. Alexander Monro, senior, was disturbed with such apprehensions, it is not wonderful, that many a poor ordinary member of the profession should have been terrified nearly out of his wits upon the subject; and for quieting this alarm, and exposing its absurdities, I really think Mr. John Bell deserving of particular praise.

In general, it is an excellent rule, in all cases of wounds of the abdomen, never to be officious about abscesses, which may take place, nor concerning such viscera, as we may suspect to be injured. It is quite time enough to interfere, when the urgency of the symptoms has confirmed our conjectures. A great deal of harm is frequently done, by handling and disturbing the wounded parts more than is necessary, and, it is well known, that wounds, which

are at first attended with most alarming symptoms, frequently terminate in a favourable manner. Persons have been known to have swords passed completely through their bodies, without suffering afterwards any threatening symptom, or, indeed, any effects which would authorise one to conclude, that the viscera had been at all injured. We are aware, that severe inflammations may not end in suppuration, and we also know, that when pus has been formed, the fluid has been often absorbed again. Nothing then indicates the necessity for giving vent to purulent matter lodged in the abdomen, except the fluctuation and situation of the abscess be very distinct, and the quantity and pressure of the matter productive of inconveniences.

For making an opening, some writers recommend a trocar; others, a lancet. The matter must be very copious and distinct, to justify the sudden introduction of such an instrument as a trocar. In other cases, the surgeon should make a cautious puncture with a lancet.

PROTRUSION OF THE VISCERA.

Wounds, penetrating the abdomen, sometimes allow considerable portions of the bowels, or omentum, to protrude, and though these viscera may not have received any injury, yet, their being displaced in this way is sometimes productive of fatal consequences.

The best mode of preventing such a catastrophe, is to return the viscera into the cavity of the abdomen, as speedily as possible. Almost all authors recommend fomenting the displaced parts, before attempting to reduce them; but, in giving this advice, they seem to forget, that, while time is lost in this preparation, the protruded bowels suffer much more harm from exposure, and other circumstances, than they can possibly receive good from any applications made to them. No kind of fomentation can be half so beneficial, as the natural warmth and moisture of the cavity of the abdomen. In order to facilitate the return of protruded piece of intestine, or omentum, the abdominal muscles should be relaxed by placing the patient in a suitable posture, and the large intestines be emptied with a glyster. In mentioning the last measure, it is not meant, that a surgeon should delay the attempt to reduce the part, until the glyster has operated. No, this means is only enumerated as one that may become serviceable, in case the surgeon cannot immediately accomplish the object in view.—The mesentery ought always to be reduced before the intestine; the intestine

before the omentum; but, the last protruded portion of each of these parts ought to be the first one reduced.

It is only when the intestine and omentum are free from gangrene and mortification, that they are invariably to be returned into the cavity of the belly, without hesitation. Also, when the protruded parts are covered with sand, dust, or other extraneous matter, it is undoubtedly proper to make them as clean as possible, before putting them back into the abdomen. For this purpose, the parts should be tenderly washed with a little luke-warm milk and water.

The two index fingers are the most convenient for reducing the parts, and, it is a rule to keep the portion, first returned, from protruding again by one finger, until it has been followed by another portion, introduced by the other finger. The second piece is to be kept up, in the same way, by the finger used to return it; and so on, till the whole of the displaced parts have been put into their natural situation.

In attempting to reduce a piece of protruded intestine, the patient should be placed in the most favourable posture; the head and chest should be elevated, and the pelvis raised with pillows. Nothing can be more absurd, than the advice to have the thorax rather lower than the pelvis, in order that the weight of the viscera may tend to draw inward the protruded parts. This is another erroneous idea, arising from the ridiculous supposition, that a great part of the abdomen is actually an empty cavity. The relaxation of the abdominal muscles is a much more rational and useful object.—When this is properly attended to, and the wound is not exceedingly small, in relation to the bulk of the protruded viscera, the parts may generally be reduced by observing the above directions. But, in addition to what has been already stated, it is necessary to remark, that the pressure should be made in a straight direction into the abdomen; for, when made obliquely, towards the edges of the wound, the parts are liable to suffer contusion, without being reduced, and even to glide between the layers of the abdominal muscles, and become strangulated. When the wound is in the front of the abdomen, pressure made in this unskilful way, may easily make the viscera slip into the sheath of the rectus muscle, and cause the same perilous symptoms, as arise from an incarcerated hernia. (See *Lernia*.)

When the reduction seems complete, the surgeon should assure himself of it, by introducing his finger into the cavity of the abdomen, so as to feel, that the parts are all actually reduced, and suffer no con-

striction between the edges of the wound and the viscera in the abdomen.

A difficulty of reduction may arise from the protruded intestines being distended with feces, or air. In this circumstance, the contents of the gut may frequently be made to pass, by little and little, into that portion of the intestinal canal, which is within the abdomen. To accomplish this purpose, the surgeon must press the contents of the bowel towards the wound, and, if he succeeds in emptying the part, he will commonly experience equal success in his next attempt to replace it in the abdomen.

Sometimes, considerable pieces of intestine are found protruded, through narrow wounds of the abdomen, and the reduction cannot be effected, without doing more violence to the bowel, than its delicate structure would bear. In this case, dilating the wound becomes indispensable. However, very frequently, when the reduction seems almost a matter of impossibility, on account of the smallness of the wound, relaxing the abdominal muscles, drawing a little more intestine out of the wound, and gently pressing the contents of the bowels, through the constriction into the abdomen, will render the protruded part sufficiently reducible, without any operation to enlarge the wound.

When such operation is unavoidable, the dilatation should be made in a direction, which will not endanger the epigastric artery, and if possible, in the same line as the muscular fibres. It would be unpardonable to make a more extensive incision than absolutely requisite, as herniæ are very much disposed to occur, wherever the peritoneum has been divided. The operation may be done with a curved bistoury and a director, much in the same way as is done in cases of strangulated ruptures. (See *Hernia*.)

Instead of enlarging wounds of the abdomen, it has been proposed to let out the air from the intestines, by making small punctures with the point of a needle, and thus lessen the volume of the protruded part sufficiently to render it easily reducible. This suggestion first originated with Ambroise Paré, who declares, that he has several times practised the method with success. Rousset, his cotemporary, also informs us, that the plan was adopted by another surgeon, in an instance, where the epigastric region was wounded, and a large portion of the intestines was protruded and strangulated. Peter Lowe, an English surgeon, likewise assures us, that he has frequently pursued such practice, when other means failed. Garengeot, Sharp, and Van Swieten, are all ad-

vocates for Paré's proposal; but they recommend employing a round needle, which will merely separate the intestinal canal, without cutting them, as a flat, triangular, sharp edged needle would unavoidably do. These last celebrated writers, however, only sanction the practice, when the quantity of protruded intestine is exceedingly great, and when it is so enormously distended with air, that it would be impossible to reduce the part, though the wound were enlarged, and every thing else, likely to promote the reduction, were put in practice. But, as the judicious Sabatier has remarked, the punctures must be entirely useless, if made with a fine needle, since they will be immediately stopped up with the mucous secretion, with which the inside of the bowels is constantly covered; and if the punctures are made with a broad triangular needle, or a very large round one, as Desault and Chopart have advised, they must be highly dangerous, inasmuch as they must be extremely likely to give rise to inflammation, and even to extravasation within the abdomen. (See *Médecine Opératoire*, Tom. i, p. 10.)

It was the circumstance of small punctures being unavailing, that led Desault and Chopart to recommend the use of a large round needle, "*pour que l'ouverture ne soit point bouchée par les mucosités dont les intestines sont enduits.*" But, they were also aware of the danger of employing such an instrument, since they give us directions how to proceed, in order to prevent extravasation and inflammation: "*On préviendra l'épanchement des matières stercorales en passant, avant de réduire l'intestin, une anse de fil dans la portion de mesentère qui répond à la pique pour la fixer contre les bords de la plaie extérieure, et l'on combattra par les remèdes généraux l'inflammation que cet pique peut attirer.*" (*Traité des Maladies Chirurg.* Tom. 2. p. 135.)

Mr. Travers, one of the latest writers upon this subject, most properly joins in the condemnation of the plan of pricking the protruded bowels. "Blancard and others protested against this practice, on the very sufficient ground of its inefficacy. La Faye very truly says, it is a useless as well as dangerous practice; for the openings, made by a round needle, cannot give issue to the containing air." Mr. Travers then cites two cases, shewing that even small stabs in a bowel will not prevent its becoming distended with air. "A man was brought to St. Thomas's hospital, on Saturday, the 30th of June last (1811,) who had been stabbed in the direction of the epigastric artery, on the left side of the abdomen, by a case knife. He died in eighteen hours, apparently from the sudden and copious hemorrhage,

which had taken place within the belly. About half a yard of ileon was protruded. The gut was highly discoloured, and so much distended, notwithstanding it was pierced in three places, that the wound of the integuments required to be freely dilated, before it could be returned. *The apertures were in fact obliterated by the mucous coat.*"

"It appeared upon the trial of Captain Sutherland (Ann. Reg. June 1809) for the murder of his cabin boy, that the intestines had been extensively protruded through a wound near the left groin, and had lain exposed for four or five hours—that the dirk had pierced through one fold of intestine, and entered another—that the wound of the intestine was *half an inch* long, that the reduction could not be accomplished until the parietal wound was dilated; and that the intestine was then returned, and the integuments sewed up." (*Travers on injuries of the Intestines*, p. 174, 176.)

I must observe, however, with respect to this last case, that it does not satisfactorily prove what the author intends it to shew, namely, *that the bowel was distended with air, though there was a wound in it half an inch long*, for, the evidence does not inform us, that the difficulty of reduction was owing to this cause. I have seen a very small portion of omentum protruded through a wound, and baffle all endeavours to reduce it for nearly an hour. The first case, adduced by Mr. Travers, however, is more explicit and interesting; and we are to infer from it, and the observations of Haller, that the punctures, made in an intestine, are not closed by mucus, as Sabatier and Desault have asserted, but by the mucous coat itself.

As the above expedient had been recommended by writers of some weight, I thought that the subject should not be passed over in silence and without a caution to the reader, never to put any confidence in the method. The plan does not facilitate the business of the operator; there is not even this solitary reason in favour of the practice; and though it may have answered when large needles were used, and some patients, so treated, may have recovered; yet, every person, who has the least knowledge of the animal economy, will easily comprehend, how even the smallest opening, made in parts, so irritable and prone to inflammation, as the bowels, must be attended with greater danger than would result from enlarging a wound of the skin and musclics. Besides the air may frequently be pressed out of the intestine in a safer way; as I have already described.

A wound of the abdomen, attended

with one of the most considerable protrusions of the viscera, that I have ever read of, is recorded by Mr. Hagne, surgeon at Ripon: "August 30th 1808 (says this gentleman,) I went to Norton Mills, about four miles from hence, to see John Brown æt. 12 years, who had received a wound in the abdomen by a wool shears. On my arrival, which was little more than an hour after the accident, I found the poor lad in a very distressing situation; the *great arch* of the stomach, and the *whole of the intestinal canal*, (duodenum excepted) contained within the abdomen, having protruded through the wound. The incision was on the left side of the body, commencing at about two inches below the scrobiculus cordis, and extending in a straight line near four inches in length, distant from the navel two inches, and he was quite sensible, and had vomited so as to empty the stomach; very little blood was lost. I immediately proceeded very carefully to examine the protruded viscera, none of which were wounded, and reduced them as quickly as possible, beginning with the stomach, and following the regular course of the intestines, in the latter portion of which, I distinctly felt feces, of rather firm consistence. He complained of some pain, during the reduction, though not much, and expressed great relief, when the parts were completely returned. I now desired an assistant, to lay the palm of his hand over the wound, and make some pressure upon it; for, I found, that, without this, the parts would soon have protruded again by the action of respiration, which was oppressed and laborious. I brought the sides of the wound together by five sutures, beginning from above downwards, and passed the needle on each side, quite through the integuments with the peritonæum, &c. The wound was also dressed with adhesive plaster, and covered with a bandage." *Vide Edinburgh Medical and Surgical Journal*, Vol. 5, p. 129, &c.

This case is really an interesting one; for, notwithstanding so unlimited a protrusion of the viscera, and the parts had been left unreduced for more than an hour, a recovery ensued, under the judicious employment of bleeding, purging, anodynes, &c.

When the protruded intestine is wounded, the opening is to be closed with a particular suture, before the part is returned into the abdomen. Of this subject, when we speak of the wounds of the intestines.

Some of the exposed intestine may have mortified, before the arrival of surgical assistance. This event is exceedingly rare in cases of wounds, but, is not

uncommon in those of strangulated hernia. The treatment will be explained in the article *Hernia*.

When the protruded intestine is in a state of inflammation, its immediate reduction is, beyond all dispute, the means most likely to set every thing right. Even when the inflammation has risen to a vehement pitch, a timely reduction of the displaced part, and the employment of anti-phlogistic means will often prevent gangrenous mischief. The dull, brown, dark red colour of the intestine may induce the practitioner to suppose, either that the part is already mortified, or must inevitably become so, and, consequently, he may delay returning it into its natural situation. But, notwithstanding this suspicious colour of the intestine, its firmness will evince, that it is not in a state of gangrene. The ultimate recovery of a portion of intestine, so circumstanced, is always a matter of uncertainty; but, the propriety of speedily replacing the part in its natural situation is a thing most certain. In case the bowel should mortify after being reduced, all hopes of the preservation of life are not to be abandoned; as we shall notice again in the subject of hernia, where every thing necessary to be known, concerning the mode of reducing protruded omentum, will also be found.

The protruded viscera having been reduced, the next object is to retain them in the abdomen, until the wound is completely healed. When the wound is small, this is a matter of no difficulty; in this instance, it is enough to put the patient in such a position, as shall relax the fibres of the wounded muscles, while the edges of the wound are maintained in contact with sticking plaster, and supported, in this way, by a compress and bandage. Costiveness is to be removed by the mildest purgatives, such as the soda phosphorata and oleum ricini, or by laxative glysters, which are still preferable. But, in cases of extensive wounds, even when the treatment is conducted with all possible judgment, it is occasionally very difficult, and impossible, to hinder the protrusion of the bowels by common dressings, and a bandage. In this circumstance the edges of the wound must be sewed together by a particular suture, named *Gastrographie*. (See this article.) It is proper to remark, however, that, in modern times, this suture is very rarely employed, in comparison with what it was formerly, and, in the description of *gastrographie*, some remarks will be offered, for the purpose of proving, that even the generality of large wounds of the abdomen do not require any suture whatsoever.

EXTRAVASATION IN THE ABDOMEN

Wounds of the abdomen may be complicated with extravasations of blood, chyle, excrement, bile, or urine. Some of these complications, however, are so frequent, as an unreflecting and inexperienced practitioner might apprehend. The employment of the phrase *cavity of the abdomen* has paved the way to much erroneous supposition upon this subject, and has induced many absurd notions, which even the sensible observations, long ago published by Petit (1c filis,) have scarcely yet dispelled.

As a modern writer has observed, "there is not truly any cavity in the human body, but, all the hollow bowels are filled with their contents, all the cavities filled with their hollow bowels, and the whole is equally and fairly pressed. Thus, in the abdomen, all the viscera are moved by the diaphragm and the abdominal muscles upwards and downwards, with an equable continual pressure, which has no interval; and one would be apt to add, the intestines have no repose, being kept thus in continual motion; but, though the action of the diaphragm, and the reaction of the abdominal muscles are alternate, the pressure is continual; the motion, which it produces, (they produce) is like that which the bowels have, when we move forwards in walking, having a motion, with respect to space, but none with regard to each other, or to the part of the belly, which covers them; the whole mass of the bowels is alternately pressed, to use a coarse illustration, as if betwixt two broad boards, which keep each turn of intestine in its right place, while the whole mass is regularly moved. When the bowels are forced down by the diaphragm, the abdominal muscles recede: when the bowels are pushed back again, it is the reaction of the abdominal muscles, that forces them back and follows them; there is never an instant of interruption of this pressure, never a moment, in which the bowels do not press against the peritoneum; nor is there the smallest reason to doubt, that the same points in each are continually opposed. We see, that the intestines do not move, or, at least, do not need to move in performing their functions; for, in hernia, where large turns of intestines are cut off by gangrene, the remaining part of the same intestines is closely fixed to the groin, and yet the bowels are easy, and their functions regular. We find the bowels regular, when they lie out of the belly, in hernia, as when a certain turn of intestine lies in the scrotum, or thigh, or, in a hernia of the navel; and where yet

they're so absolutely fixed, that the piece of intestine is marked by the straitness of the ngs. We find a person, after a wound of the intestine, having free stools for many days; and what is it that prevents the feces from escaping, but merely this regular and universal pressure? We find a person, on the fourth or fifth day, with feces coming from the wound! a proof, surely, that the wound of the intestine is still opposite, or nearly opposite, to an external wound. We find the same patient recovering without one bad sign! What better proof than this could we desire, that none of the feces have exuded into the abdomen?

"If, in a wound of the stomach, the food could get easily out by that wound, the stomach would unload itself that way, there would be no vomiting, the patient must die; but, so regular and continual is this pressure, that the instant a man is wounded in the stomach, he vomits, he continues vomiting for many days, while not one particle escapes into the cavity of the abdomen. The outward wound is commonly opposite to that of the stomach, and, by that passage, some part of the food comes out; but, when any accident removes the inward wound of the stomach from the outward wound, the abdominal muscles press upon the stomach, and follow it so closely, that if there be not a mere laceration extremely wide, this pressure closes the hole, keeps the food in, enables the patient to vomit, and not a particle, even of jellies, or soups, is ever lost, or goes out into the cavity of the belly.

"How (proceeds Mr. J. Bell) without this universal and continual pressure, could the viscera be supported? Could its ligaments, as we call them, support the weight of the liver? Or, what could support the weight of the stomach when filled? Could the mesentery, or omentum, support the intestines; or could its own ligaments, as we still name them, support the womb? How, without this uniform pressure, could these viscera fail to give way and burst? How could the circulation of the abdomen go on? How could the liver and spleen, so turgid as they are with blood, fail to burst? Or what possibly could support the loose veins and arteries of the abdomen, since many of them, e. g. the splenic vein, is, (are) two feet in length, is (are) of the diameter of the thumb, and has (have) no other, than the common pellucid and delicate coats of the veins? How could the viscera of the abdomen bear shocks and falls, if not supported by the universal pressure of surrounding parts? In short, the accident of hernia being forced out by any blow upon the belly, or by any sudden strain, explains to us how perfectly full

the abdomen is, and how ill it is able to bear any pressure, even from its own muscles, without some point yielding, and some one of its bowels being thrown out. And the sickness and faintness, which immediately follow the drawing off of the waters of a dropsy, explain to us, what are the consequences of such pressure being even for a moment relaxed. But, perhaps, one of the strongest proofs is this, that the principle must be acknowledged, in order to explain what happens daily in wounds; for, though in theory we should be inclined to make this distinction, that the hernia, or abscess of the intestines, will adhere and be safe, but, that wounded intestines, not having time to adhere, will become flaccid, as we see them do in dissections, and so, falling away from the external wound, will pour out their feces into the abdomen, and prove fatal; though we should settle this, as a fair and good distinction in theory, we find, that it will never answer in practice. Soldiers recover daily from the most desperate wounds; and the most likely reasons, that we can assign for it, are, the fulness of the abdomen, the universal, equable, and gentle pressure; and the active disposition of the peritoneum, ready to inflame with the slightest touch. The wounded intestine is, by the universal pressure, kept close to the external wound, and the peritoneum and the intestine, are equally inclined to adhere. In a few hours, that adhesion is begun, which is to save the patient's life, and the lips of the wounded intestine are glued to the lips of the external wound. Thus, is the side of the intestine united to the inner surface of the abdomen; and, though the gut casts out its feces, while the wound is open; though it often casts them out more freely, while the first inflammation lasts; yet, the feces resume their regular course, whenever the wound is disposed to close." (*John Bell's Discourses on Wounds*, p. 323, 327, edit. 3.)

The foregoing extract, though drawn up in a most careless style contains such observations, as are well calculated to make the reader understand, that the abdomen is in reality not a cavity, but a compact mass of containing and contained parts; that the close manner in which the various surfaces are constantly in contact, must powerfully oppose extravasations; and that, in fact, it often entirely prevents them. The passage cited impresses us with the utility of that quick propensity to the adhesive inflammation, which prevails throughout every peritoneal surface, and which not only often has the effect of permanently hindering effusion of the contents of the viscera, by agglutinat-

ing the parts together, but which, even when an extravasation has happened, beneficially confines the effused fluid in one mass, and surrounds it with such adhesions of the parts to each other, as are rapid in their formation, and effectual for the purposes of limiting the extent of the effusion, and preventing the irritation of the extravasated matter from affecting the rest of the abdomen.

It is to M. Petit, that we are indebted for the introduction of more correct modes of thinking upon the foregoing subject, and, as his valuable observations in the *Mem. de l'Acad. de Chirurgie*, are highly interesting, it is my intention to introduce them into this Dictionary, in the article, *Extravasation*, to which, for the present, I shall be content with referring.

But, notwithstanding the influence of the reciprocal pressure of the containing and contained parts against each other, and the useful effect of the quickly arising adhesive inflammation, in all penetrating wounds of the belly, complicated with the injuries of the viscera, we are not to suppose, that extravasation never happens; but, only that it is much less frequent than has been commonly supposed. Mr. Travers, with much laudable industry, has endeavoured to trace more minutely, than any preceding writer, the particular circumstances, under which effusions in the abdomen are likely or unlikely to happen. "It being admitted (says he) that there are cases, in which effusion does take place, it is easy to conceive circumstances, which must considerably influence this event. If, for example, the stomach and bowels be in a state of emptiness, the nausea, which follows the injury, will maintain that state. If the extent of the wound be considerable, the matter will more readily pass through the wound, than along the canal. A wound of the same dimensions in the small and the large intestines, will more readily evacuate the former, than the latter, because it bears a larger proportion to the calibre. Incised and punctured wounds admit of the adhesion of the cut edges, or the eversion of the internal coat of the gut, so as to be in many instances actually obliterated; whereas, lacerated, or ulcerated opening, do not admit of these salutary processes. Again, in a transverse section of the bowel, contraction of the circular fibre closes the wound, whereas in a longitudinal section, the contraction of this fibre enlarges it. Such (says Mr. Travers) are the circumstances, which combined, in a greater or less degree, increase or diminish the tendency to effusion." (*On Injuries of Intestines, &c.* p. 13—14.)

After the details of some experiments

and cases, the preceding author makes among other conclusions, the following :

1. That effusion is not an ordinary consequence of penetrating wounds.

2. That, if the gut be full and the wound extensive, the surrounding pressure is overcome, by the natural action of the bowel tending to the expulsion of its contents.

3. That, if food has not recently been taken, and the wound amounts to a division of the gut, or nearly so, the eversion and contraction of the orifice of the tube, prevent effusion.

4. That, if the canal be empty at the time of the wound, no subsequent state of the bowel will cause effusion, because the supervening inflammation agglutinates the surrounding surfaces, and forms a circumscribed sac; nor can effusion take place from a bowel at the moment full, provided it retains a certain portion of its cylinder entire, the wound not amounting nearly to a semidivision of the tube, for then the eversion and contraction are too partial to prevent an extravasation.

5. That, when however air has escaped from the bowel, or blood has been extravasated in quantity within the abdomen at the time of the injury, the resistance, opposed to effusion, will be less effectual, although the parietal pressure is the same, as such fluids will yield more readily, than the solids naturally in contact. *P.* 25—26, 100.

6. That, though extravasation is not common in penetrating wounds, it follows more generally in cases, where the bowel is ruptured by blows, or falls upon the belly, while the integuments continued unwounded. *P.* 36.

7. That when the bowels are perforated by ulceration, there is more tendency to effusion, than in cases of wounds. *P.* 38, &c.

Mr. Travers attempts to explain the reason of the greater tendency to effusion, in cases of intestine burst by violence, and in those of ulceration "by the difference in the nature of the injury, which the bowel sustains, when perforated by a sword or bullet, as in the one case, or burst or ulcerated in the other. A rupture by concussion could only take place under a distended state of the bowel, a condition most favourable to effusion, and from the texture of the part, a rupture, so produced would seldom be of limited extent. The process of ulceration, by which an aperture is formed, commences in the internal coat of the bowel, which has always incurred a more extensive lesion, than the peritoneal covering. The puncture, or cut is merely a solution of continuity in a point, or line; the ulcerated wound is

an actual loss of substance. The consequence of this difference is, that, while the former, if small, is glued up by the effusion from the cut vessels, or, if large, is nearly obliterated, by the full eversion of the villous coat, the latter is a permanent orifice." P. 46.

How much Mr. Travers and Mr. John Bell differ in opinion, upon these latter points, will appear from the following passage: after adverting to the adhesion, which takes place between the viscera and the peritoneum, under a variety of circumstances attending disease, Mr. John Bell observes: "this it is, which makes the chief difference, in point of danger, betwixt an ulcerated and a wounded intestine; for, in a wound, there is, as we should suppose, no time for adhesion, nothing to keep the parts in contact, no cause, by which the adhesion might be produced. But, in an ulcer, there is a slow disease, tedious inflammation, adhesion first, and abscess, and bursting afterwards; sometimes a fistula remains discharging feces, and sometimes there is a perfect cure. If a nutshell, a large coin, a bone, or any dangerous thing be swallowed, it stops in the stomach, causing swelling and dreadful pain; at last, a hard, firm tumour appears, and then it suppurates, bursts, the bowel opens, the food is discharged at every meal, till the fistula gradually lessens, and heals at last. But, where the stomach is cut with a broad wound of a sabre, the blood from the wounded epiploic vessels, or the food itself, too often pours out into the abdomen, and the patient dies." &c. (*Discourses on Wounds*, p. 321, edit. 3.) The author afterwards proceeds to explain how the compact state of the containing and contained parts, and the incessant and equal pressure, which the viscera sustain, frequently hinders effusion in cases of penetrating wounds.

Which of these gentlemen is most correct on the subject, I cannot pretend to say. Mr. Travers has certainly adduced a few cases, in favour of his own statement. Whether they are deviations from what is most common, can only be decided by a comparative examination of a greater number of facts. When the intestines ulcerate, and thus rid themselves of foreign bodies, the general tenor of the cases on record undoubtedly affords us little reason to be apprehensive of extravasation. Yet, with respect to ulceration of the intestines from other causes, circumstances may be very different.

Blood is more frequently extravasated in the abdomen, than any other fluid. Extravasations of this kind, however, do

not invariably happen, whenever vessels of not a very considerable size are wounded. The compact state of the abdominal viscera, in regard to each other, and their action on each other, oppose this effect. The action, alluded to, which depends on the abdominal muscles and diaphragm, is rendered very manifest by what happens, in consequence of operations for hernia attended with alteration of the intestines, or omentum. If these viscera should burst, or suppurate, after being reduced, the matter which escapes from them, or the pus, which they secrete, is not lost in the abdomen; but is propelled towards the wound of the skin, and there makes its exit. The intestinal matter, effused from a mortified bowel, has been known to remain lodged the whole interval, between one time of dressing the wound and another, in consequence of the surgeon stopping up the external wound with a large tent. When the abovementioned action or pressure of the muscles, is not sufficient to keep the blood from making its escape from the vessels, still it may hinder it from becoming diffused among the convolutions of the viscera, and thus the extravasation is confined in one mass. The blood, effused and accumulated in this way, is commonly lodged at the inferior and anterior part of the abdomen, above the lateral part of the pubes, and by the side of one of the recti muscles. The weight of the blood may propel it into this situation, or, perhaps, there may be less resistance in this direction, than in another. In opening the bodies of persons, who have died with such extravasations, things may put on a different aspect, and the blood seem to be promiscuously extravasated over every part of the abdomen. But, when such bodies are examined with care, it will be found, that the blood does not insinuate itself among the viscera, till the moment when the abdomen is opened, and the mass previously lies in a kind of pouch. This pouch is frequently circumscribed, and bounded by thick membranes, especially when the extravasation has been of some standing. (*Sabatier Médecine Opératoire Tom. 1, p. 28—30.*)

It is of the highest consequence to a practical surgeon to remember well, that all the parts contained in the abdomen are closely in contact with each other, and with the inner surface of the peritoneum. This is one grand reason, why extravasations are seldom so extensively diffused as one might imagine; but, commonly lie in one mass, as Petit, Sabatier and all the best moderns have noticed. The pressure of the elastic bowels, of the diaphragm, and abdominal muscles, not only fre-

quently presents an obstacle to the diffusion of extravasated matter, but often serves to propel it towards the mouth of the wound. The records of surgery make mention of numerous instances, in which persons have been stabbed through the body, without any fatal consequences, and sometimes without the symptoms being even severe. In Mr. Travers's publication many cases, exemplifying this observation, are quoted from a variety of sources; Fab. Hildan Obs. Chirurg. Cent. 5. Obs. 74. Œuvres de Paré, liv. 10. Chap. 35. Wiseman's Surgery, p. 371. La Motte's *Traité Complet de Chirurgie*, &c. &c. In such cases the bowels have been supposed to have eluded the point of the weapon, and this may perhaps in a few instances, have been actually the fact; but, in almost all such examples, there can be no doubt, that the bowels have been punctured, and an extravasation of intestinal matter has been prevented by the opposite pressure of the adjacent viscera. Such resistance and pressure may, also, have occasionally obliged intestinal matter, or blood, actually extravasated, to pass through the wound of the bowel into its cavity, and thus be speedily removed. Certain it is, such copious evacuations of blood *per anum* have followed stabs of the abdomen, as could hardly proceed from the arteries of the intestines. This way of getting rid of an extravasation must be rare, however, compared with that by absorption.

The pouch, or cyst, including extravasated blood, or matter, as mentioned by Sabatier, is formed by the same process, which circumscribes the matter of abscesses. (See *Suppuration*.) It is in short the adhesive inflammation. All the surfaces in contact with each other, and surrounding the extravasation, and track of the wound, generally soon become so intimately connected together by the adhesive inflammation, that the place in which the extravasation is lodged, is a cavity entirely destitute of all communication with the cavity of the peritoneum. The track of the wound leads to the seat of the effused fluid, but, has no distinct opening into the general cavity of the abdomen. The rapidity with which the above adhesions form, is often very great, almost incredible.

It should be known, however, that extravasations are occasionally diffused in various degrees among the viscera, owing to the patient being subjected to a great deal of motion, or his having violent spasmodic contractions of the intestines, arising from the irritation of the extravasated matter. Urine and bile are more frequently dispersed to a great extent among the abdominal viscera, than blood. The latter fluid, indeed, must often coagulate; a

circumstance, that must both tend to stop further hemorrhage, and confine the extravasation in one mass.

SYMPTOMS AND TREATMENT OF EXTRAVASATIONS IN THE ABDOMEN.

1. *Blood.*

Wounds of the spleen, and of such veins and arteries, as are above a certain size, almost always prove fatal from internal hemorrhage. The blood generally makes its way downwards, and accumulates at the inferior part of the abdomen, unless the existence of adhesions happen to oppose the descent of the fluid to the most depending situation. The belly swells, and the fluctuation of a fluid is perceptible through the anterior part of the abdominal parietes. The patient grows pale, loses his strength, is affected with syncope, and his pulse becomes weaker and weaker. In short, the symptoms, annually attendant on hemorrhage, are observable. The viscera and vessels in the abdomen being continually compressed on all sides, by the surrounding parts, the blood cannot be effused, without overcoming a certain degree of resistance; and unless a vessel of the first magnitude, like the aorta, the vena cava, or one of their principal branches, has been wounded, the blood escapes from the vessel slowly, and several days elapse, before any considerable quantity has accumulated in the lesser cavity of the pelvis.

In these cases of extravasated blood, the symptoms which, perhaps, had disappeared, under the employment of bleeding and anodyne medicines, now come on again. A soft, fluctuating tumour may be felt at the lower part of the abdomen; sometimes on the right side; sometimes on the left; occasionally, on both sides. The pressure, made by the effused blood on the urinary bladder, excites distressing inclinations to make water; while the pressure, which the sigmoid flexure of the colon suffers, is the cause of obstinate constipation. In the mean time, the quantity of extravasated blood increasing, irritation and inflammation of the peritoneum are induced. The pulse grows weaker; debility ensues; the countenance is moistened with cold perspirations; and, unless instigated by all the antecedent circumstances, the surgeon practices an incision for the discharge of the fluid, the patient falls a victim to the accident.

In the year 1733, Vacher, principal surgeon of the military hospital at Besançon, successfully adopted this mode of treatment, as I shall more particularly notice in the article *Extravasation*. Petit (the son) afterwards tried the same plan, though it did not answer, (as is alleged) in consequence of the inflammation having advanced

too far, before the operation was performed. Long before the time of Vacher and Petit, a successful instance of similar practice had been recorded by Cabrole, in a work, which this author published, under the title of *Αλφαβητον ανατομικον*, id est, *Anatomes elenchus accuratissimus, omnes humani corporis partes ed quæ solent secari methodo, delineans. Accessere osteologia, observationes que Medicis ac Chirurgis perutiles. Genevæ 1604.* Hence, as Sabatier has remarked, the method pursued by Vacher, was not so new as Petit imagined. (*Médecine Opératoire, Tom. 1, p. 32.*)

Indeed, when the symptoms leave no doubt of there being a large quantity of blood extravasated in the abdomen; when the patient's complaints are of a very serious nature, and are evidently owing to the irritation and pressure of the blood on the surrounding viscera; and when a local swelling denotes the seat of the extravasation, there cannot be two opinions about the propriety of making an incision for its evacuation.

Surgeons, however, should recollect, that a small extravasation of the blood may exist, without producing any very considerable irritation, provided no opening be made into the cyst, with which it becomes surrounded. On the contrary, when such cyst is opened, the air then having free access to the blood contained there, that part of the fluid, which cannot be discharged, is very apt to putrify, and become so irritating, as to excite inflammation of the surrounding parts.—Even though there may be an evident extravasation of blood, the bad symptoms are also sometimes entirely owing to the injury done to the parts within the abdomen, and neither to the pressure, nor the irritation of the effused blood.

But, sometimes as we have already noticed, the accumulated blood at first, neither irritates the adjacent parts by its quantity nor quality. An inflammation, however, of the parts surrounding the extravasation at length takes place. The tension, irritation, and pain, which, in the first instance arose from the wound itself, and subsided, seem now to be renewed. When the extravasation is at the lower and anterior part of the abdomen, the patient experiences pain about the hypogastric region. He is also constipated, and, as he suffers great irritation of the bladder, he feels frequent propensities to make water, but cannot relieve himself. At last, a tumour makes its appearance, attended with a fluctuation more or less distinct.

In this instance, it seems proper to give vent to the accumulated blood. If this fluid should be found coagulated, injections of warm water would facilitate its

discharge. (*Sabatier Médecine Opératoire, Tom. 1*)

2. Chyle and Fæces.

These are not so easily extravasated in the abdomen as blood, because they do not require so much resistance, on the outside of the stomach and intestines, to make them continue their natural rout through the alimentary canal, as blood requires to keep it in the vessels. Extravasations of this kind, however, sometimes happen, when the wound is large and the bowel distended at the moment of the injury, or when, as Mr. Travers has likewise explained, air is extravasated, or blood effused in the abdomen; these fluids being incapable of making effectual resistance to the escape of the intestinal matter. (See an *Enquiry into the Process of Nature in repairing Injuries of the Intestines, &c.* p 26.) Nothing is a better proof of the difficulty with which chyle and feces are extravasated, than the operation of an emetic, when the stomach is wounded and full of aliment. In this instance, if the resistance to the extravasation of the contents of the stomach were not considerable, they would be effused in the abdomen, instead of being vomited up. A peculiarity in wounds of the stomach and intestines is, that the opening, which allows their contents to escape, may also allow them to return into the wounded viscus.

Extravasation of intestinal matter in the abdomen is attended with a severe train of febrile symptoms; dryness of the mouth, tongue, and fauces; considerable pain and swelling of the belly; convulsive startings; and hiccough and vomiting, with which the patients are generally attacked on the day after that, on which the wound was received. (*Sabatier de la Médecine Opératoire, Tom. 1, p. 34.*)

In these cases, general means are the only ones which can be employed; venesection, fomentations, low diet, perfect rest, anodynes, &c. All solid food must be most strictly prohibited. The close state of the viscera may also be increased by applying a bandage round the body.

If the symptoms are not speedily assuaged, the abdominal viscera become affected with general inflammation, and gangrene, and the patients die in the course of a few days.

3. Bile.

Bile, on account of its great fluidity, is more easily extravasated extensively in the abdomen, than either blood, or the contents of the stomach and intestines. Besides, the gall bladder has the power of contracting itself so completely, as to expel the whole of its contents. Notwithstanding

these circumstances, however, extravasations of this kind are exceedingly uncommon, doubtless, on account of the small size of the gall bladder, and its deep guarded situation, between the concave surface of the liver, and upper part of the transverse arch of the colon.

Sabatier informs us, that he has only been able to find one example on record. This case, after having been communicated to the Royal Society of London, by Dr. Steward, (No. 414, page 341. Abridgm. Tom. 7, page 571—572,) was inserted, as an extract, in the third volume of the Edinburgh Essays, and also in the third volume of Van Swieten's Commentaries on the Aphorisms of Børhaave, (transl. p. 65, edit. 1754.) An officer received a wound, penetrating the cavity of the abdomen, and entering the fundus of the gall bladder, without doing any material injury to the adjacent parts. The abdomen was immediately distended, as if the patient had been afflicted with an ascites, or tympanitis; nor, did the swelling either increase, or diminish till the patient's death, which happened a week after the infliction of the wound.

There was no rumbling noise in the abdomen, though it was exceedingly tense. There were no stools, and very little urine was discharged, notwithstanding purgatives, and glysters, and a good deal of liquid nourishment, were given. The patient never had one instant of sound sleep, but, was always restless, though anodynes were exhibited. There was no appearance of fever, and the pulse was always natural till the last day of the patient's life, when it became intermittent. The intestines were found after death, very much distended, the gall bladder quite empty, and a large quantity of bile extravasated in the abdomen.

Sabatier met with an opportunity of observing the symptoms of an extravasation of bile, in consequence of a wound of the gall bladder. The patient's abdomen swelled very quickly; his respiration became difficult, and he soon afterwards complained of tension and pain in the right hypochondrium. His pulse was small, frequent, and contracted; his extremities were cold, and his countenance very pale. The bleedings, which were practised the first day, gave him a little relief; but, the tension of the abdomen, and the difficulty of breathing, still continued. A third bleeding threw the patient into the lowest state of weakness, and he vomited up a greenish matter. On the third day, the lower part of the belly was observed to be more prominent, and there was no doubt of an extravasation. M. Sabatier introduced a trocar, and gave vent to a green blackish fluid, which had no smell, and

was pure bile, that had escaped from the wound of the gall bladder. After the operation, the patient grew weaker and weaker, and died in a few hours. On opening the body, a large quantity of yellow bile was found between the peritoneum and intestines; but, it had not insinuated itself among the convolutions of the viscera. A thick gluten connected the bowels together, and they were prodigiously distended. The gall bladder was shrivelled and almost empty. Towards its fundus, there was a wound, about a line and a half long, corresponding to a similar wound in the peritoneum. The wound, which had occurred at the middle and lower part of the right hypochondrium, between the third and fourth false ribs, had glided from behind forward, and from above downward, between the cartilages of the ribs, until it reached the fundus of the gall bladder.

Sabatier takes notice, that the symptoms of the two cases, which have just now been related, were very similar. Both the patients were affected with an exceedingly tense swelling of the belly unattended with pain, or borborygmus, and they were both obstinately constipated. Their pulse was extremely weak the latter days of their indisposition, and they were afflicted with hiccough, nausea, and vomiting. We must not positively infer, however, that such exactly would be the symptoms in every instance of a wound of the gall bladder, unaccompanied by injury of other viscera: this conclusion only admits of confirmation by attention to more numerous facts.

M. Sabatier seems to think one thing certain, viz. that wounds of the gall bladder attended with effusion of bile, are absolutely mortal, and that no operation can be of any avail. (*Médecine Opératoire*, Tom. 1, p. 34—37.

4. Urine.

Urine being of a very fluid nature may, like the bile, be easily extravasated in the abdomen, when the bladder is wounded at any part, which is connected with the peritoneum. If the urine, in this kind of case, be not drawn off with a catheter, so as to prevent this fluid issuing by the wound of the bladder, the patient soon perishes. There are many instances recorded of the bladder being injured even by gun shot wounds, which were not mortal. Such wounds, however, might only have injured the sides, or lower part of the bladder. But, in operating for the stone, above the pubes, the bladder has undoubtedly been occasionally cut at the part of the fundus, which is covered with the peritoneum. However, as the accident was known in the first instance, the right treatment was adopted, and such patients have

recovered. (*Sabatier, Médecine Opératoire, Tom. 1, p. 37.*)

WOUNDS OF THE INTESTINES.

The vomiting of blood, or discharge of it by stool, the escape of fetid air, or of intestinal matter, from the mouth of the wound; an empty collapsed state of a portion of bowel, protruded at the opening in the skin, are the common symptoms attending a wound of this kind. When the wound is situated in the protruded portion, it is obvious to the surgeon's eye; but when it affects a part of the intestinal canal within the abdomen, the nature of the case can only be known by a consideration of other symptoms. In addition to such as I have already described, there are some others, which ordinarily accompany wounds of the bowels; as, for instance, oppression about the præcordia, acute or griping pain in the belly, cold sweats, syncope, &c. But unless the wounded intestine be protruded, there is no practical good in knowing, whether the bowel is injured or not, since, if it be in the abdomen, the treatment ought not to be materially different from that of a simple penetrating wound of the belly, unattended with a wound of any of the viscera. A wounded intestine is said to present some particular appearances, to which the generality of writers have paid no attention: "If a gut be punctured, the elasticity of the peritoneum, and the contraction of the muscular fibres, open the wound, and the villous, or mucous coat forms a sort of hernial protrusion, and obliterates the aperture. If an incised wound be made, the edges are drawn asunder and reverted, so that the mucous coat is elevated in the form of a fleshy lip. If the section be transverse, the lip is broad and bulbous, and acquires tumefaction and redness from the contraction of the circular fibres behind it, which produces, relatively to the everted portion, the appearance of a cervix. If the incision is according to the length of the cylinder, the lip is narrow, and the contraction of the adjacent longitudinal, resisting that of the circular fibres, gives the orifice an oval form. This eversion and contraction are produced by that series of motions, which constitutes the peristaltic action of the intestines." (*Travers on Injuries of the Intestines, p. 85.*)

According to this gentleman, some of these appearances were described by Haller, in *Element. Physiol. lib. 24, sect. 2, and Opera Minora, tom. 1, sect. 15.*

Having witnessed the facility, with which considerable injuries of the intestinal tube were repaired, Mr. Travers was desirous of ascertaining more fully the powers of

nature in the process of spontaneous reparation, and of determining, under how great a degree of injury, it would commence, as well as the mode of its accomplishment. For these purposes, he divided the small intestine of several dogs as far as the mesentery. All these animals died, in consequence of the intestinal matter being extravasated, if they had been lately fed, or if they had been fasting in consequence of inflammation, attended with a separation of the ends of the divided bowel, eversion of the mucous coat, and obliteration of the cavity, partly, by this eversion, and partly by a plug of coagulated chyle.

In one particular instance in which Mr. Travers made a division of the bowel, half through its diameter, a sort of pouch was formed round the injured intestine. "A pouch, resembling somewhat the diverticulum in these animals, was formed opposite to the external wound, on the side of the parietes, by the lining peritoneum, on the other side, by the mesentery of the injured intestine, that intestine itself, and an adjacent fold, which had contracted with it a close adhesion. The pouch, thus formed and insulated, included the opposed sections of the gut, and had received its contents, &c. The tube, at the orifices, was narrowed by the half eversion, but, offered no impediment to the passage of fluids." (*P. 96.*) Whether, under these circumstances, the functions of the alimentary canal could have been continued, Mr. Travers professes himself incapable of deciding. Among the inferences, which this gentleman has drawn from the experiments, detailed in his publication, the tendency of the two portions of a divided bowel to recede from each other, instead of coalescing to repair the injury, merits notice, in as much as it tends to shew, that the only means of spontaneous reparation consists in the formation of an adventitious canal, by the encircling bowels and their appendages. The everted mucous coat, which is the part opposed to the surrounding peritoneum, is also indisposed to the adhesive inflammation.

When, however, the wound of the intestine is smaller, the obstacles to reparation are not absolutely insurmountable. Here, retraction is prevented, and the processes of eversion and contraction modified by the limited extent of the injury. If, therefore, the adhesive inflammation unite the contiguous surfaces, effusion will be prevented, and the animal escape immediate destruction. But, union can only take place through the medium of the surrounding parts.

According to Mr. Travers, it is the retraction, immediately following the wound, that is a chief obstacle to the reparation of

the injury; for, if the division be performed in such a way, as to prevent retraction, the canal will be restored in so short a time, as but slightly to interrupt the digestive function. In confirmation of this state, a ligature was tightly applied round the duodenum of a dog, which became ill, but entirely recovered, and was killed. "A ligature, fastened around the intestine, divides the interior coats of the gut, in this effect resembling the operation of a ligature upon an artery. The peritoneal tunic alone maintains its integrity. The inflammation, which the ligature induces on either side of it, is terminated by the deposition of a coat of lymph, which is exterior to the ligature, and quickly becomes organized. When the ligature, thus enclosed, is liberated by the ulcerative process, it falls of necessity into the canal and passes off with its contents." (P. 103, 104.)

It appears also from Mr Travers's experiments and observations, that longitudinal wounds of the bowels are more easily repaired, than such as are transverse. In a dog, a longitudinal wound, of the extent of an inch and a half, was repaired by the adhesive inflammation. Here the process of eversion is very limited; the aperture bears a smaller proportion to the cylinder of the bowel, and the entire longitudinal fibres resist the action of the circular, which are divided, and can now only slightly lessen the area of the canal. (P. 108.)

We come now to the consideration of the treatment, which may be proper in cases of wounds of the intestines; a subject in which much difference of opinion has prevailed; principally, however, concerning the circumstances, in which sutures are necessary, and the most advantageous way of applying them.

When the wounded bowel lies within the cavity of the abdomen, no surgeon of the present day would have the rashness to think of attempting to expose the injured intestine, for the purpose of sewing up the breach of continuity in it. In fact, the surgeon seldom knows at first what has happened; and when the nature of the case is afterwards manifested, by the discharge of blood per anum, an extravasation of intestinal matter, &c. it would be impossible to get at the injured part of the bowel, not only because its exact situation is unknown, but, more particularly, on account of the adhesions, which are always formed with surprising rapidity. But, even if the surgeon knew, to a certainty, in the first instance, that one of the bowels was wounded, and the precise situation of the injury, no suture could be applied, without considerably enlarging the external wound, drawing the wounded intestine out of the cavity of the abdomen, and handling and

disturbing all the adjacent viscera. Nothing would be more likely, than such proceedings, to render the accident, which may originally be curable, unavoidably fatal. I entirely agree upon this point with Mr. John Bell, who says, "When there is a wounded intestine, which we are warned of only by the passing out of the feces, we must not pretend to search for it, nor put in our finger, nor expect to sew it to the wound; but we may trust, that the universal pressure, which prevents great effusion of blood, and collects the blood into one place, that very pressure, which always causes the wounded bowel and no other to protrude, will make the two wounds, the outward wound and the inward wound of the intestine oppose each other, point to point; and, if all be kept there quiet, though but for one day, so lively is the tendency to inflame, that the adhesion, will be begun, which is to save the patient's life." (*Discourses on Wounds*, p. 361, edit. 3.)

When the extravasation, and other symptoms, a few days after the accident, shew the nature of the case, a suture can be of no use whatever, as the adhesive inflammation has already fixed the part in its situation, and the space, in which the extravasation lies, is completely separated from the general cavity of the abdomen, by the surrounding adhesions.

When the bowel is not protruded, and the opening in it is situated closely behind the wound in the peritoneum, a suture is not requisite, for the contents of the gut not passing onward, will be discharged from the outer wound, and not be diffused among the viscera, if care be taken to keep the external wound open. There is no danger of the wounded bowel changing its situation, and becoming distant from the wound in the peritoneum, for the situation which it now occupies, is its natural one. Nothing, but violent motion, or exertions, could cause so unfavourable an occurrence, and, these should always be avoided. The adhesions, which take place in the course of a day or two, at length render it impossible for the bowel to shift its situation.

Things, however, are far different when the wounded part of the bowel happens to be protruded. Here we have the authority of all writers, in sanction of the employment of a suture. No enlargement of the outer wound is requisite to enable the practitioner to adopt such practice; there is no disturbance created by the adjacent parts; there is no doubt concerning the actual existence of the injury; no difficulty in immediately finding out its situation.

But, though authors are so generally agreed about the propriety of using a suture, in the case of a wounded and pro-

truded bowel, they differ exceedingly, both as to the right object of the method, and the most advantageous mode of sewing the injured part of the intestine. Some have little apprehension of extravasation, advise only one stitch to be made, and use the ligature chiefly with a view of confining the injured bowel near the external wound, so that, in the event of an extravasation, the effused matter may find its way outward. Other writers wish to remove the possibility of extravasation, by applying numerous stiches, and attach little importance to the plan of using the ligature principally for the purpose of keeping the intestine near the superficial wound.

When the wound of a bowel is so small, that it is closed by the protrusion of the villous coat, the application of a suture must evidently be altogether needless, and since the ligature would not fail to cause irritation, as an extraneous substance, the employment of it ought unquestionably to be dispensed with.

Supposing, however, the breach in the intestine to be small, but yet sufficient to let the feces escape, what method ought to be adopted? The following practice seems rational. As Mr. Astley Cooper was performing the operation for a strangulated hernia, at Guy's hospital, an aperture, giving issue to the intestinal contents, was discovered in a portion of the sound bowel, just when the part was about to be reduced. The operator, including the aperture in his forceps, caused a fine silk ligature to be carried beneath the point of the instrument, firmly tied upon the gut, and the ends cut off close to the intestine. The part was then replaced, and the patient did well. Mr. Travers, who has related this fact, approves of the plan of cutting away the extremities of the ligature, instead of leaving them hanging out of the external wound. It appears, that, when the first practice is followed, the remnant always makes its way into the intestine, and is discharged with the stools, without any inconvenience. But, when the long ends are drawn through the outer wound, and left in it, they materially retard the process of healing. (*See Travers on Injuries of the Intestines, &c. p. 112, 113.*)

Let us now enquire into what ought to be the conduct of a surgeon, should he be called to a patient, whose bowel is divided through its whole cylinder, and protruded out of the external wound.

Various have been the schemes and proposals, for the treatment of this sort of accident; and since experience has furnished few practitioners with an opportunity of seeing such a case in the human subject, a variety of experiments have been made on animals, in order to determine what treat-

ment would be the most successful. Ramdohr, indeed, is stated by Moebius, to have had occasion to try, on the human subject, a plan, of which a vast deal has been said and written. He cut off a large part of a mortified intestine, and joined the two sound ends together, by inserting the upper within the lower one, and fixing them in this position with a suture, the ligature being also employed to keep them at the same time near the external wound. The patient recovered, and the feces continued to pass entirely by the rectum in the natural way. (*See Haller's Disput. Anat. Vol. 6. Obs. Med. Miscellan. 18.*)

Moebius attempted to repeat Ramdohr's operation upon a dog; but, he could not succeed in insinuating the upper part of the divided bowel into the lower one, on account of the contraction of the two ends of the intestinal tube, and the smallness of the canal. Moebius, therefore, was obliged to be content with merely bringing the ends of the bowel together with a suture: the animal died, however, of an extravasation of the feces.

Dr. Smith, of the Philadelphia Medical Society, also tried to repeat Ramdohr's method, but could not succeed. He divided the intestine of a dog transversely, and having inserted a piece of candle into that portion of the bowel, which was supposed to be uppermost, he endeavoured to introduce the superior within the inferior; but, the ends became so inverted, that it was found utterly impossible to succeed. The scheme was therefore given up, and only one stitch made, the ligature being then attached to the external wound, in the manner advised by Mr. John Bell. The dog died, and, on examination, there was found a considerable quantity of feces and water in the abdominal cavity.

Two other trials were made of Mr. John Bell's plan by Dr. Smith, on the intestines of dogs: in both instances the animals died, the intestines being much inflamed, and feces effused in the abdomen. (*See Dr. Smith's Thesis.*)

Mr. Travers likewise tried the same experiment. "I divided the small intestine of a dog, which had been for some hours fasting, and carried a fine stitch through the everted edges, at the point opposite to their connexion with the mesentery. The gut was then allowed to slip back, and the wound was closed. The animal survived only a few hours. *Examination.* The peritoneum appeared highly inflamed. Adhesions were formed among the neighbouring folds, and lymph was deposited in masses upon the sides of the wounded gut. This presented two large circular orifices. Among the viscera were found a quantity of bilious fluid, and some extraneous sub-

stances, and a worm was depending from one of the apertures. By the artificial connexion of the edges in a single point of their circumference, and their natural connexion at the mesentery, they could recede only in the intervals, and here they had receded to the utmost." In another experiment, Mr. Travers increased the number of points of contact, by placing three single stitches upon a divided intestine, cutting away the threads, and returning the gut. The animal died on the second day. *Examination.* Similar marks of inflammation presented themselves. The omentum was partially wrapped about the wound; but, one of the spaces, between the sutures was uncovered, and from this the intestinal fluids had escaped. On cautiously raising the adhering omentum, the remaining stitches came into view. Here again the retraction was considerable, and the intervening elliptical aperture proportionally large. On the side, next to the peritoneum, however, the edges were in contact and adhered, so as to unite the sections at an angle.

From such experiments, the conclusion, drawn by Mr. Travers, is, that apposition, at a point, or points, as respects effusion, more disadvantageous, than no apposition at all; for, it admits of retraction, and prevents contraction, so that each stitch becomes the extremity of an aperture, the area of which is determined by the distance of the stitches. (P. 116, 119.) This gentleman, therefore maintains, that the absolute contact of the everted surfaces of a divided intestine, in their entire circumference, is requisite to secure the animal from the danger of abdominal effusion. (P. 121.) The species of suture employed (says Mr. Travers) is of secondary importance, if it secures this contact. (P. 134.) And among other observations, I find "wounds amounting to a direct division of the canal are irreparable, and therefore invariably fatal." (P. 133.)

Without entertaining the least desire to give offence, I confess, I do not know what could induce Mr. Travers to be so positive in these inferences. We are told, that apposition at a point, or points, is, as respects effusion, more disadvantageous than no apposition at all, and that the absolute contact of the divided surfaces, in their entire circumference, is requisite to secure the animal from the danger of abdominal effusion. The foundation of these unqualified conclusions is five experiments, made on dogs, in four of which experiments, the divided bowel was brought together with one stitch, on Mr. John Bell's plan, while, in another three stitches were made; and, yet, in all these instances, the animals died with the con-

tents of the bowels effused. So far the inferences seem established. Unfortunately, for their stability, however, Mr. Travers immediately afterwards proceeds to relate other experiments, instituted by Mr. Astley Cooper, Dr. Thomson, and Dr. Smith, which, though Mr. Travers seems unaware of the fact, tend most completely to overturn the conclusions which he had been previously making.

"Mr. Cooper repeated the experiments of Duverger, who had succeeded, in uniting by suture, the divided intestine of a dog, including in it a portion of the trachea of a calf. In place of the uninterrupted suture, three distinct stitches were inserted. On the sixteenth day, the animal was killed, and the union was complete." (P. 123.)

Here we have two facts, proving that a wounded intestine may be united, though the suture was not such, as to maintain the divided surfaces in contact, in the whole of their circumference.

Mr. Astley Cooper then made the experiment, without including the foreign substance. The animal recovered, being a third fact, tending to shew, that the absolute contact of every point of the ends of the divided bowel is not essential to the cure. (See *A. Cooper on Inguinal and Congenital Hernia. Chap. II.*)

After dividing the small intestine of a dog, Dr. Thomson, Regius professor of Military Surgery at Edinburgh, applied five interrupted stitches, at equal intervals, the ends of the ligatures, were cut off, and the external wound was closed with a suture. This animal did not die of the operation, and, when he was afterwards killed, it appeared, that the threads had made their way into the interior of the intestinal canal. Dr. Thomson repeated this experiment, and did not kill the animal till six weeks afterwards, when the same tendency of ligatures to pass into the bowels, and be thus discharged, was exemplified.

These two last cases make five, in proof that the absolute contact of every part of the ends of a divided bowel is not essential to prevent effusion, or the consequences of the wound from proving fatal; and several other experiments were made by Dr. Smith, of Philadelphia, who employed four stitches, with similar success.

As far then as the majority of such facts ought to have weight, we are bound to receive the conclusions of Mr. Travers as incorrect, and unestablished. I am only surprised, that Mr. Travers himself, who has cited the particulars of all these last experiments, did not perceive, that they struck directly at his own inferences. They are not only irresistible

arguments against Mr. Travers's conclusion, that the union of a divided bowel requires the contact of the cut extremities in their entire circumference; but, they are a plain denial of another position, advanced by this author, viz. that wounds, amounting to a direct division of the canal are irreparable, and, therefore, invariably fatal.

With respect to the species of suture being of secondary importance, provided it secure the complete contact of every part of the everted ends of the divided bowel, I regret, that Mr. Travers has omitted to institute experiments, in order to shew, that any such suture can be practised, and, if he has the ingenuity to apply it, whether the result would be for, or against, the conclusions, which he has formed. The fact of the sutures always making their way into the cavity of the bowel, and being thus got rid of, appears to me highly interesting, since it shews the safety of cutting away the ends, instead of leaving them hanging out of the external wound, so as to create the usual irritation and inconveniences of extraneous substances. It seems, that Mr. Benjamin Bell first recommended cutting the ends of the ligatures away, and reducing the bowel in this state into the abdomen, as he says, a considerable part of the remainder of the ligature will fall into the cavity of the gut. (*System of Surgery, Vol. II. p. 128, Edit. 7.*) We have seen, that the experiments of Dr. Thomson confirm the observation, and those, instituted by Mr. Travers, tend to the same conclusion.

According to the latter writer, the following is the process by which a divided intestine is healed, when sutures are employed. "It commences with the agglutination of the contiguous mucous surfaces, probably, by the exudation of a fluid, similar to that, which glues together the sides of a recent flesh wound, when supported in contact. The adhesive inflammation supervenes, and binds down the everted edges of the peritoneal coat, from the whole circumference of which a layer of coagulable lymph is effused, so as to envelope the wounded bowel. The action of the longitudinal fibres, being opposed to the artificial connexion, the sections mutually recede, as the sutures loosen by the process of ulcerative absorption. During this time, the lymph deposited becomes organized, by which further retraction is prevented, and the original cylinder, with the threads attached to it, is encompassed by the new tunic.

"The gut ulcerates at the points of the ligatures, and these fall into its canal. The fissures, left by the ligatures, are

gradually healed up; but, the opposed villous surfaces, so far as my observation goes, neither adhere, nor become consolidated by granulation, so that the interstice, marking the division internally is probably never obliterated." (*Travers on Injuries of the Intestine, &c. p. 128.*)

Notwithstanding I have carefully read all the arguments adduced by Mr. Travers in favour of stitching a divided bowel at as many points as possible, I still remain unconvinced of the advantage of such practice, for reasons already suggested. If a case were to present itself to me, in which a bowel was protruded and partly cut through, I should apply only a single suture, made with a common sewing needle, and a piece of fine silk. If the bowel were completely cut across, I should have no objection to attach its ends together by means of two or three stitches of the same kind. I coincide with Mr. Travers respecting the advantage of cutting off the ends of the ligature, instead of leaving them in the wound, as I believe he is right, in regard to the little chance there is of the injured intestine receding far from the wound, and if the ends of the ligature are then of no use in keeping the bowel in this position they must be objectionable, as extraneous substances.

Sometimes, only one end of the divided gut protrudes at the wound, and, the other lies concealed in the cavity of the abdomen. If the hidden continuation of the intestinal canal, cannot be found without enlarging the wound, it may be questioned, whether the urgency of the case does not justify this practice. If the upper end should happen to be the one concealed in the abdomen, almost certain death must result from its continuance there; if it be the lower one, and no attempt be made to find it, the patient can only survive with the loathsome affliction of an artificial anus.

When the protruded intestine is mortified, which must be a very rare occurrence in cases of wounds, the surgeon's conduct should be the same as in a mortified enterocoele. (See *Hernia.*)

With regard to the constitutional treatment, in wounds of the intestines, the principal indication is to prevent a dangerous degree of inflammation. Hence bleeding and the antiphlogistic treatment are highly indispensable. Let not the surgeon be deterred from putting such practice in execution by the apparent debility of the patient, his small concentrated pulse, and the coldness of his extremities, symptoms, common in acute inflammation of the bowels, and, in fact, themselves indicating the propriety of repeated vene-

section. Wounds of the small intestines are attended with more vehement inflammation, than those of the large ones. All flatulent, stimulating, and solid food, is to be prohibited. The bowels are to be daily emptied with glysters, by which means, no matter will be allowed to accumulate in the intestinal canal, so as to create irritation and distention.

When excrementitious matter is discharged from the outer wound, it is highly necessary to clean and dress it very frequently. Gentle pressure should also be made, with the fingers, at the circumference of the wound, at each time of applying the dressings, for the purpose of promoting the escape of any extravasated matter. For the same reason, the patient should always lie, if convenient, in a posture that will render the external opening a depending one.

After a day or two, the surgeon need not be afraid of letting the outer wound heal up; for the adhesive inflammation, all around the course of the wound, will now prevent any extravasated matter from becoming diffused among the viscera. If the case should end well, the intestine generally undergoes a diminution in its diameter at the place where the wound was situated. When this contraction is inconsiderable, the patient occasionally experiences colic pains at the part, especially after eating such food, as tends to produce flatulence. As these pains usually go entirely off after a certain time, and no inconvenience whatsoever remains, the intestine may possibly regain its wonted capacity again. A more considerable constriction of the above sort has been known to have occasioned a fatal misere. Even the intestine itself has been known to burst in this situation, after its contents had accumulated behind the contracted part. Patients, who have recovered from wounds of the intestines, should ever afterwards be particularly careful not to swallow any hard substances, or indigestible, flatulent food.

In some instances, intestinal matter continues to be discharged from the outer wound, either in part, or entirely, so that either a fistula, or an artificial anus is the consequence. A fistula is more apt to follow, when an intestine has been injured by a ball, has been quite cut through, or has mortified. But, numerous cases have evinced, that this is not invariably the consequence, and that a perfect cure has frequently followed each of these occurrences.

When an intestine is completely cut through, and the lower portion of the canal lies inaccessibly concealed in the abdomen, there is a necessity for promoting

the formation of an artificial anus. In this particular case, the extremity of the intestine is to be attached, with a fine suture, to the edges of the outer wound. In order to distinguish the upper end of the intestine from the lower one, some recommend giving the patient some milk to drink, and to wait a little, to see whether the fluid issues from the mouth of the gut. In the mean while, they content themselves with applying fomentations. If the upper end of the intestine should be in the abdomen, it certainly seems justifiable, when the accident is quite recent, to dilate the outer wound sufficiently to see, whether the part is near enough to be got at. If the surgeon should succeed in this object, the two ends of the bowel ought to be sewed together, as above directed.

In gun-shot wounds of the abdomen, the treatment is limited to the employment of general means. For information, relative to wounds of the abdomen, see *Richter's Anfangsgrunde der Wundarzneykunst*, Band 5. Kap. 1. *Discourses on the Nature and Cure of Wounds*, by John Bell, Edit. 3. *Encyclopédie Méthodique, Partie Chirurgicale, Art. Abdomen, and Intestins*. *Dr. Smith's Inaugural Thesis. An Enquiry into the Process of Nature in repairing Injuries of the intestines, &c.* by B. Travers. *Hunter on Gun-shot Wounds*. *Mr. A. Cooper's work on Inguinal and Congenital Hernia*, Chap. II. *Sabatier's Médecine Opératoire*, Tom. 1. *Essai sur les Epanchemens*, and *Smith de l'Essai sur les Epanchemens* par M. Petit, le fils, in *Mem. de l'Acad. de Chirurgie*, Tom. 2 and 4, Edit. in 12mo.

ABSCCESS. This term signifies a tumour containing pus, or a collection of purulent matter. Authors differ about the original derivation of the word. The most common opinion is, that it comes from the Latin *abscedo*, to depart, because parts, which were before contiguous, become separated, or depart from each other.

Abscesses are divided into two principal kinds, viz. *acute* and *chronic*. For every thing, relative to the former, see *Suppuration*; and, for information, concerning the latter, refer to *Lambar Abscess*. The *Mammary Abscess* is a distinct article. See also the articles, *Antrum*, *Anus Abscesses of*, *Bubo*, *Empyema*, *Hypopium*, *Whitlow*, &c.

ACANTHA'BOLUS. (from *ακανθα*, a thorn, and *βαλλω*, to cast out.) An instrument for taking thorns out of the flesh, and described by Paulus Ægineta. It is said to be like an instrument called the volsella, used for extracting bones from the œsophagus, and foreign substances from wounds.

A'CCIPITER, (a hawk.) The name of a bandage, which was formerly employ-

ed by surgeons for covering the nose: it derived its name from its supposed resemblance to a hawk's claw.

ACCRETION. A growing together of parts, as of the toes, or fingers to each other, in consequence of burns, &c.

ACETUM. *Vinegar.* (From *aceto*, to be acid.) Called in the last Pharmacopœia of the London College, *Acidum Aceticum*. Vinegar is an article of very considerable use in surgery. Mixed with farinaceous substances, it is frequently applied to sprained joints, and, in conjunction with alcohol and water, it makes an eligible lotion for inflammations of the surface of the body. Vinegar has acquired reputation at the Gloucester Infirmary, for quickening the exfoliation of dead bone, which effect may be owing to its property of dissolving the phosphate of lime. The excellent effects of vinegar, when immediately applied to burns and scalds, have been taken particular notice of by Mr. Cleghorn, a brewer in Edinburgh, who communicated his sentiments to Mr. Hunter. (See *Med. Facts and Observations*, Vol. II.) See the Article, *Burns*.

In chronic inflammations of the eyes and eyelids, vinegar has lately been brought into considerable repute. It is also recommended as an application, in certain instances, in which the eyes are weak and watery. It is said to be an efficacious remedy even in cases of acute ophthalmia, after topical and general bleeding. Whenever vinegar is applied to the eye, it is in a diluted state, as may be seen in another part of this work. (See *Collyrium Acidi Acetici*.)

Very strong vinegar may be obtained by freezing and separating the water, which is mixed with the acid. When thus concentrated, it is said to be an excellent styptic for stopping hemorrhage from the nose. With this view, it may be used either as an injection, or a lotion, in which lint is to be dipped, and afterwards introduced up the nostril.

ACHILLES, Tendon of. So called, because as fable reports, Thetis, the mother of Achilles, held him by that part, when she dipped him in the river Styx, to make him invulnerable. It signifies that great and powerful tendon, which is formed by the junction of the gastrocnemius and soleus muscles, and which extends along the posterior part of the tibia, from the calf to the heel. When this tendon is unfortunately cut, or ruptured, as it may be, in consequence of a violent exertion, or spasm of the muscles, of which it is a continuation, the use of the leg is immediately lost, and unless the part be afterwards successfully united, the patient must remain a cripple for life.

The ancient surgeons seem not to have been well acquainted with the rupture of the tendo Achillis, which they probably might mistake for a sprain, or some other complaint. In cases, in which this part had been cut, they recommended approximating the separated portions, and maintaining them in contact by means of a suture.

When the ruptured tendo Achillis, was afterwards better understood, the plan, just mentioned, was even adopted in this case, the integuments having been previously divided, for the purpose of bringing the tendon into view. But, there is no necessity for having recourse to this painful proceeding. (*Encyclopédie Méthodique, Partie Chirurgicale, Tom. 1, p. 55.*)

The superficial situation of the tendo Achillis, always renders the diagnosis of its rupture exceedingly obvious, and the accident can only become at all difficult to detect, when there is a considerable degree of swelling, which is very rare. When the tendon has been cut, the division of the skin even allows the accident to be seen. When the tendon has been ruptured, the patient hears a sound, like that of the smack of a whip, at the moment of the occurrence. In whatever way the tendon has been divided, there is a sudden incapacity, or, at least, an extreme difficulty, either of standing or walking. Hence, the patient falls down, and cannot get up again. Besides these symptoms, there is a very palpable depression, between the ends of the tendon, which depression is increased when the foot is bent, and diminished, or even quite removed, when the foot is extended.

The patient can spontaneously bend his foot, none of the flexor muscles, being interested. The power of extending the foot is still possible, as the peronei muscles, the tibialis posticus, and long flexors, remain perfect, and may perform this motion. (*Œuvres Chirurgicales de Desault par Bichat, Tom. 1*)

The indications are to bring the ends of the divided part together, and to keep them so, until they have become firmly united. The first object is easily fulfilled by putting the foot in a state of complete extension; the second, namely, that of keeping the ends of the tendon in contact, is more difficult.

In order to have a right comprehension of the indications, we should consider what keeps the ends of the tendon from being in contact. The flexion of the foot has this effect on the lower portion; the contraction of the gastrocnemius, and a soleus on the upper one. The indications then are to put the foot in an unalterable state of extension, and to counteract the action of the above muscles.

The action of the muscles may be opposed: 1. By keeping these powers in a continual state of relaxation. For this purpose, the leg must be kept half bent upon the thigh. 2. By applying methodical pressure to the muscles; methodical, because it is to operate on the fleshy portion of the muscles, and not on the tendon, the ends of which being depressed by it, would be separated from each other, and, instead of growing together, would unite to the adjacent parts. The pressure should also operate so as to prevent the ends of the tendon from inclining either to the right or left.

This kind of pressure, which the bandage ought to make, seems to have escaped the attention of all authors. Who cannot see, however, that the action of the muscles being by this means resisted, the upper end of the tendon will not have such a tendency to be drawn upward, and separated from the lower one? (*Œuvres Chirurgicales de Desault par Bichat, Tom. 1.*)

The famous Petit seems entitled to the honour of having first devised the plan of treating the ruptured, or divided tendo Achillis, by keeping the leg and foot in a particular posture, with the aid of an apparatus. Seeing that the extension of the foot brought the ends of the tendon into contact, it occurred to him that such extension should be maintained during the whole of the treatment, in order to bring about a permanent union. This happy idea, the simplicity of which should have rendered it obvious to all practitioners, once having originated, became the common basis, on which have been founded all the numerous methods of cure, which have been since recommended. (*Desault par Bichat.*)

The celebrated Dr. Alexander Monro, professor of anatomy at Edinburgh, happened to rupture his tendo Achillis. When the accident took place, he heard a loud crack, as if he had suddenly broke a nut with his heel, and he experienced a sensation, as if the heel of his shoe had made a hole in the floor. This sensation, he says, has also been observed, by others, though some have complained of a smart stroke, like what would be produced by a stone or cane. Immediately suspecting what had happened, the doctor extended his left foot, in which the occurrence had taken place, as strongly as he could with his right hand, while with his left, he pressed the muscles of the calf downward, so as to bring the ends of the broken tendon as near together as possible. In this position he sat, until two surgeons came to his assistance. They applied compresses, and a bent board to the upper part of the foot, and forepart of the leg, both which they

kept, as nearly as possible, in a straight line, by a tight bandage, made with a long roller. But, as this mode of dressing soon became very uneasy, it was changed for the following one. A footsock, or slipper, was made of double quilted ticking, from the heel of which a belt or strap projected, of sufficient length to come up over the calf of the leg. A strong piece, of the same materials, was prepared of sufficient breadth to surround the calf, and this was fastened with lacings. On the back part of this was a buckle, through which the strap of the footsock was passed, so that the foot could be extended, and the calf brought down at pleasure. The leg and foot were wrapt up in soft flannel, fumigated with benzoin, and the bandage was kept on day and night, the belt being made tighter, when the doctor was about to go to sleep, and loosened when he was awake, and on his guard. For a fortnight, he did not move his foot and leg at all, but, was conveyed in a chair on castors from one part of the room to another. After this, he began to move the ankle-joint, but in such a gentle manner as not to give any pain. The degree of motion was gradually increased, as the tendon became capable of bearing it, care being taken to stop, when the motion began to create uneasiness. The affected limb was moved in this way, for half an hour at a time. In a few days, the hollow, between the separated ends of the tendon, became imperceptible, though the part continued soft much longer. It became, however, gradually thicker and harder until a knot was at last formed in it, apparently of a cartilaginous nature. Though this was at first as large as a middling plum, and gradually became softer and smaller, yet it did not disappear entirely. Having occasion to go out six weeks after the accident, the doctor put on a pair of shoes, with heels two inches high, and contrived a steel machine to keep his foot in the proper position. This machine, however, he afterwards changed for another, made of the same materials as the former. It was not till five months after the accident, that he thought proper to lay aside all assistance, and to put the strength of the tendon to a trial. (See *Monro's Works, p. 661.*)

It seems unnecessary to enumerate the various plans, devised since the time of Petit. Suffice it to state, that both in a wound and rupture of the tendo Achillis, the ancient method of using a suture, for keeping the ends of the tendon in contact, is at present quite exploded, and position of the limb is the grand agent, by which the cure is now universally accomplished. The following was Desault's method, which, though it was expressly designed

to fulfil all the above-mentioned indications, may not after all be a more valuable practical plan, than the one adopted by Dr. Monro. After the ends of the tendon had been brought into contact, by moderate flexion of the knee, and complete extension of the foot, Desault used to fill up the hollows, on each side of the tendon with soft lint and compresses. The roller, applied to the limb, made as much pressure on these compresses, as on the tendon, and hence this part could not be depressed too much against the subjacent parts. Desault next took a compress, about two inches broad, and long enough to reach from the toes to the middle of the thigh, and placed it under the foot, over the back of the leg, and lower part of the thigh. He then began to apply a few circles of a roller round the end of the foot, so as to fix the lower extremity of the longitudinal compress. After covering the whole foot with the roller, he used to make the bandage describe the figure of 8, passing it under the foot, and across the place where the tendon was ruptured, and the method was finished by encircling the limb upward, with the roller, as far as the upper end of the longitudinal compress. (*Desault par Bichat.*)

Certainly this plan seems to answer every object, and may be worthy of being adopted in this country. The continued pressure on the muscles of the calf, by which their action is materially resisted, is too much disregarded by the generality of English surgeons. Consult *Monro's Works*; *Encyclopédie Méthodique, Article Achille, tendon d'*, and *Mémoire sur la division du tendon d'Achille, in Œuvres Chirurgicales de Desault par Bichat, Tom. 1, p. 306.*

ACHIORES, (from *αχῶρες*, bran.) The scald head, so called from the branny scales thrown off it. (See *Tinea Capitis.*)

ACIDUM NITROSUM, now called by the London College, *Acidum Nitricum*. Dr. Rollo, Mr. Cruikshank, Dr. Beddoes, Mr. Blair, and many others have tried this acid, as a substitute for quicksilver in the cure of the lues venerea. The practice began with Mr. Scott, a surgeon in Bengal, who is said to have caught the idea from Dr. Girtanner, who suggested, that the efficacy of the various preparations of quicksilver might arise from the oxygen, which they contained.

A multitude of cases have been brought forward in favour of nitric acid, as an antisyphilitic, but, there are also some others adduced, which seem very decidedly to controvert its claims to that character. It should be carefully remembered, that it is the *nitric* acid, not the *nitrous*, which seems to deserve a further trial in syphilitic cases.

Mr. Pearson is of opinion, that the power of this medicine has not yet been ascertained in so satisfactory a way as to preclude all difference of opinion on the subject.

Another writer says, that the symptoms of confirmed lues venerea are not removed by nitrous acid; but, that the medicine has been used both liberally and successfully for removing the debilitating effects of mercury, for giving tone to the stomach, improving the appetite, and imparting a granulating and healthy aspect to certain ulcers remaining after a due course of mercury had been tried, and which were aggravated by persevering in the use of the latter medicine. The effects of this acid in syphilis, will be more particularly noticed, in the article *Veneral Disease*.

Nitrous acid, given in doses of eight, ten, or fifteen drops, two, or three times a day, is said to have proved particularly efficacious in the cure of some eruptive complaints, especially of the lower extremities, and joined with disorder of the liver (*Wilson's Pharm. Chirurgica, p. 6.*)

The common way of giving the nitric acid, at first, is to mix ʒj with a pint of distilled water, the mixture being sweetened with simple syrup. This quantity is to be drank, at different times, in the course of 24 hours, through a small glass tube, which is used to keep the teeth from being injured. If no inconvenience is felt, the dose of the acid may be increased to ʒiiss, ʒij, and even, in certain cases, to ʒijj.

The acid is said to increase the appetite, and secretion of urine; to cause more or less thirst, a white tongue, size blood, and an increase in the actions of the whole system, but nothing like mercurial salivation is produced. It does not agree, however, equally well with all constitutions.

The nitric acid is beneficial both in the *primary* and *secondary* symptoms of the venereal disease; more so, however, in the former. But, in the latter, even mercury itself frequently fails, and proves hurtful, so that the nitric acid suffers no disparagement from this fact. A change is said to be produced on the disease, by the acid, in six or eight days, and a cure very often in little more than a fortnight.

The oxygenated muriatic of pot-ash which contains an immense quantity of oxygen, is said by Mr. Cruikshank, to be more efficacious than the nitric acid in relieving venereal symptoms.

A'CME. (from *ακμη*, a point.) The highest pitch of a disease.

A'CNA, or **A'CNE**. (from *ακνη*, bran, or

chaff.) A hard, purplish tubercle in the face, covered with a scale.

ACORES. See *Achors*.

ACOUSTICS. Medicines, or instruments to assist the hearing. The term is derived from *ακουω*, to hear.

ACROMION. (from *ακρον*, the top, and *ωμος*, the shoulder.) The process of the scapula, articulated with the external end of the clavicle, and formed by the anterior and superior projecting part of the spine of the scapula. It is liable to be broken. (See *Fracture*.)

ACTUAL CAUTERY. A heated iron formerly much used in surgery for the extirpation and cure of diseases. The instrument was made in various shapes, adapted to different cases, and it was often applied through a cannula, in order that no injury might be done to the surrounding parts. *Actual* cauteries were so called in opposition to other applications, which, though they were not really hot, produced the same effect as fire, and, consequently, were named *virtual*, or *potential cauteries*.

ACUPUNCTURE. (from *acus*, a needle, and *pungo*, to prick.) The operation of making small punctures in certain parts of the body with a needle, for the purpose of relieving diseases, as is practised in Siam, Japan, and other oriental countries, for the cure of headaches, lethargies, convulsions, colics, &c. (See *Phil. Trans.* No. 148)

ACUTENACULUM. (from *acus*, a needle, and *teneo*, to hold.) Heister so denominates the port aiguille. It is a handle for a needle, to make it penetrate the flesh more easily.

ADAMITA. Lithiasis, or the stone in the bladder. (See *Urinary Calculi* and *Lithotomy*.)

ADHESIVE INFLAMMATION. That kind of inflammation, which makes parts of the body adhere, or grow together. It is the process, by which recent incised wounds are often united, without any suppuration, and it is frequently synonymous with union by the first intention. (See *Union by the First Intention*.)

ADYNAMIA. (from *α*, neg. and *δυναμις*, strength.) Extreme debility.

ÆGIAS. (from *αιξ*, a goat.) A white speck upon the cornea, opposite the pupil, and so named from the supposition, that goats were very subject to such a disorder.

ÆGYDES. (from *αιξ*, a goat.) Small white scars, or opacities, on the cornea.

ÆGYLOPS. (from *αιξ*, a goat, and *ωψ*, an eye.) A disease, so named from the supposition that goats were very subject to it. The term means a sore just under the inner angle of the eye.

The best modern surgeons seem to consider the *ægylops*, only as a stage of the fistula lachrymalis. Mr. Pott remarks, when the skin covering the lachrymal sac has been for some time inflamed, or subject to frequently returning inflammations, it most commonly happens, that the puncta lachrymalia are affected by it, and the fluid, not having an opportunity of passing off by them, distends the inflamed skin, so that, at last, it becomes sloughy, and bursts externally. This is that state of the disease, which is called perfect *ægylops*, or *ægylops*. (Pott in *Fistula Lachrymalis*.)

Ægylops was a very common term with the old surgical writers, who certainly did not suspect, that obstruction in the lachrymal parts of the eye, is so frequently the cause of the sore, as it really is. The skin over the lachrymal sac must undoubtedly be, like that in every other situation, not exempt from inflammation, and abscesses; but, we do not find, that sores, unconnected with disease of the lachrymal sac, are so frequent, as to merit a distinct appellation. The term, *ægylops* is therefore going more and more into disuse, every day.

ÆRUGO, (*Subacetas Cupri Impura*) prepared verdigrease is by some used as an application to incipient chancre. Its acting as a caustic, and completely destroying the diseased surface at once, seems to offer a chance of preventing the absorption of the venereal matter, and, consequently, of doing away the necessity of making the patient undergo a salivation. However, it is perhaps never safe to rely solely upon this mode of treatment, without exhibiting mercury, in some form, or another.

Whenever the plan is tried, and it is certainly a very rational one, as long as the chancre is very small and recent, it is better to employ the *argentum nitratum*, which is a more active caustic, and for this reason, more sure to destroy the whole surface of the sore.

AGARIC. A species of fungus, growing on the oak, and much celebrated formerly for its efficacy in stopping bleeding. (See *Hemorrhage*.)

AGGLUTINATION. The union of parts; the adhesion of parts together, by an effusion of coagulating lymph, followed by a communication of vessels.

AGGLUTINANTS. Applications employed with a view of giving an opportunity for the opposite surfaces of a wound to adhere and grow together.

AGOMPHIASIS. (from *α*, neg. and *γομφος*, compact.) A painful looseness of the teeth.

AIR. For an account of the absurd

opinions entertained, concerning its entrance into several cavities of the body, and its pernicious effects there, see *Abdomen*.

ALBORA. A species of itch, or rather leprosy.

ALBUGO, (from *albus*, white.) A white opacity of the cornea, not of a superficial kind, but affecting the very substance of this membrane. This disease is very similar to the leucoma, with which it will be considered. (See *Leucoma*.)

ALNUS, (the Alder Tree.) The leaves, when cut in small pieces, and applied to the breast, as warm as can be borne, are much praised by professor Murray, of Göttingen, for their efficacy in discussing the milk of women, who do not suckle.

ALPHONSIN is the name of an instrument for extracting balls. It is so called from the name of its inventor Alphonso Ferrier, a Neapolitan physician. It consists of three branches, which separate from each other by their elasticity, but are capable of being closed by means of a tube, in which they are included.

ALUM. (an Arabic word.) Alum, either in its simple state, or deprived of its water of crystallization, by being burnt, has long been used in surgery. The ingenious author of the *Pharmacopœia Chirurgica* remarks, that unless for external use, as a dry powder, the virtues of alum are not improved by exposure to fire. Ten grains of alum made into a bolus with conserve of roses, are given thrice a day at Guy's Hospital, in such cases, as demand powerful tonic, or astringent remedies. In a relaxed state of the urinary passages, or want of power of the sphincter vesicæ, small doses of alum have been found of service.

It is also recommended by Dr. Percival, to counteract the poison of lead. Burnt alum is a mild caustic, and is a principal ingredient in most styptic powders.

ALVINE CONCRETIONS. Surgical writers have recorded many instances, in which concretions of various sizes, and producing a series of very bad and even fatal complaints have been formed round plum and cherry stones in the alimentary canal. The knowledge of the dangerous consequences, which may ensue from swallowing such indigestible bodies, cannot be too extensively diffused; for, it is certain, that this pernicious habit of children and thoughtless persons is by no means uncommon, and must be a more frequent occasion of ill-health, if not of death, than is generally supposed.

The symptoms induced by the lodgment of concretions of the above kind in the bowels are of a formidable description: severe pains in the stomach and bowels, diarrhœa, violent vomitings of blood and

mucus, a discharge of thin fetid matter from the rectum, a difficulty of voiding the excrement, an afflicting tenesmus, extreme emaciation, and debility.

That the foregoing account is not at all exaggerated may be seen by a perusal of the cases, and remarks published on the subject by Mr. Charles White, of Manchester, and Mr. Hey, of Leeds.

I shall take the liberty of quoting a case from each of these gentlemen. The first example is one related by Mr. White, shewing the proper mode to be pursued, when practicable.

"On March 2, 1762, Dr. Brown desired I would visit J. Parkinson, of Manchester, an out-patient of the infirmary, who had been some time under his care for complaints much resembling nephritic paroxysms, which the medicines, usual in such cases, had frequently relieved. The night before he had perceived a lump in the rectum, which had brought on a continual tenesmus. I found him extremely emaciated; the sphincter ani very much dilated, with a continual discharge of thin, excrementitious, and very fetid matter. Upon introducing my finger into the anus, I very distinctly felt a large body moveable in the rectum, which I easily took hold of with a pair of forceps, such as are used in lithotomy, and immediately brought away without much difficulty. It was a ball nearly as big as my fist, and, breaking in the extraction, discovered a plum-stone in the centre, which was its nucleus. Upon further examination, I found there was another, which I extracted entire nearly as large as the first. The patient recovered very fast, and in a month's time, was a hearty strong man." (*Cases in Surgery with remarks, &c.*)

The concretions, which form round fruit stones in the intestinal canal, may become so large as to be incapable of passing onward to the rectum, and, of course, occasion fatal complaints. The annexed case, recorded by Mr. Hey, furnishes us with a proof of this remark. "I was permitted (says this practical writer) to examine the body of a boy, whose parents lived at Holbeck, near Leeds, and who had died in an emaciated state, having had long continued pain in the abdomen, attended with frequent attacks of the ileus.

"I found lying in the transverse arch of the colon a concretion which was become of so great bulk, that it could pass no farther along the course of the intestine. This seemed to have been the sole cause of the boy's death."—*Practical Observations in Surgery*, p. 492.

Sometimes, patients ultimately get well

by voiding the concretions either by vomiting, or stool. Mr. Charles White gives us an account of some such instances; in one fourteen concretions on plum-stones were discharged from the anus; in another, twenty-one similar bodies were ejected from the stomach.

The latter gentleman concludes some interesting cases with warning practitioners, and mankind in general, of the great danger of swallowing fruit-stones, and he doubts not, that many persons have lost their lives from this cause, when the disorder has not been understood, but been mistaken for the cholici.

The reader may find the principal information on this subject, in *Cases in Surgery* by Charles White, F. R. S. 1770. p. 17. *Philos. Trans. abridged*, Vol. V. p. 256. *et seq.* *Edinburgh Med. Essays and Observ.* Vol. 1. p. 301. *Ibid.* Vol. 5. p. 431. *Essays Phys. and Literary*, Vol. II. p. 345. Dr. Leigh's *Natural History of Lancashire*, Plate I. fig. 4. *Practical Observations in Surgery*, by W. Hey, F. R. S. p. 490.

AMAURO'SIS, (from *αμαρρω*, to obscure.) Frequently called, *Gutta Serena*. This is a disease of the eye, attended with a diminution, or total loss of sight, and arising from a paralytic affection of the retina and optic nerve.

The symptoms of amaurosis are noted for being extremely irregular, and the diagnosis of the disease is often much more difficult, than is commonly supposed, when there is no visible defect in the eye, and we have nothing more than the patient's assurance, that he has lost the faculty of seeing things. In many cases the pupil is very much dilated, immoveable, and possesses its natural black colour, and usual transparency. It cannot be denied, that this is the state of numerous cases; but it is equally true, that there are many exceptions. Sometimes, in the most complete and incurable cases, the pupil is of its proper size, and even capable of very free motion; and, occasionally, it is actually smaller and more contracted, than natural. We have the authority of Richter for asserting, that in particular instances, the iris not only possesses a power of motion, but is capable of moving with uncommon activity, so that, in a very moderate light, it will contract in an unusual degree, and nearly close the pupil. (*Anfangsgründe der Wundarzneykunst*, Band. 3. p. 424, Edit. 1795.)

Two or three remarkable instances of the active state of the iris, in cases of amaurosis, were some time ago shewn to me by Mr. Albert, surgeon of the York Hospital, Chelsea, and I have seen some other similar cases in St. Bartholomew's Hospital. The patients alluded to, had

most of them not the least power of distinguishing the difference, between total darkness, and the vivid light of the sun, or a candle placed just before their eyes. Janin and Richter have seen the pupil capable of motion, in this disease, and Schnucker has twice seen the same fact.

From the various conditions of the pupil, in different cases of *gutta serena*, no conclusions, entitled to much confidence, can even be drawn, with regard to the particular nature and character of the complaint. For instance, the moveable or immoveable state of the pupil can neither be considered, as a favourable, or unfavourable circumstance. Sometimes an amaurosis may be cured, which is attended with a pupil extraordinarily dilated, and entirely motionless. Sometimes, the disorder proves incurable, notwithstanding the pupil is of its proper size, and capable of motion. There are likewise examples, in which the pupil recovers its moveableness, in the course of the treatment, although nothing will succeed in re-establishing the sight. (*Richter, Op. cit.* p. 425.)

The pupil of an eye, affected with amaurosis, (says this experienced surgeon) seldom exhibits the clear shining blackness, which is seen in a healthy eye. In general it is of a dull, glossy, hornlike blackness, which symptom alone is frequently enough to apprise a well-informed practitioner of the nature of the disease. Sometimes the colour of the pupil has an inclination to green; while, in other examples, this aperture seems to be dense, white, and cloudy, so that the complaint might easily be mistaken for the beginning of a cataract. This error, into which inexperienced surgeons are liable to fall, may easily be avoided by attention to the following circumstances. The misty appearance is not situated close behind the pupil, in the place of the crystalline lens; but, frequently, is manifestly deeper in the eye. Nor is it in proportion to the impairment of sight, the patient being quite blind, while the misty appearance is so trivial, that, if it arose from the opacity of the crystalline lens, it could at most only occasion a slight weakness and obscurity in vision. It must be acknowledged, that it is more difficult to avoid mistake, when a beginning amaurosis is accompanied with this cloudiness in the eye, and consequently, when the degree of blindness seems to bear some proportion to the degree of mistiness in the pupil. However, in this case, if we are to credit the observations of Richter, the true nature of the disease may generally be known, by considering, that though the patient's sight is weak, it is not rendered faulty by an appearance of mist before the eyes, which latter circumstance

is always complained of by persons, who are beginning to be afflicted with cataracts; not to mention that there are usually present several other symptoms, which exclusively belong to the gutta serena.

Sometimes, the interior of the eye, a good way behind the pupil, seems quite white, and a concave light coloured surface may be observed, upon which the ramifications of blood-vessels can be plainly seen. In particular instances, this white surface extends over the whole back part of the eye; while in other cases, it only occupies a half, or a small portion of it. This peculiar appearance has been ascribed to a loss of transparency in the retina itself, and a consequent reflection of the rays of light. (*Huller, Element. Physiol. Tom. 5, p. 409.*)

There can now be no doubt, that such whiteness behind the pupil must sometimes have originated from the diseased mass, which, in cases of fungus hæmatodes of the eye, grows from the deeper part of this organ, and gradually makes its way forward to the iris, being always attended with total loss of sight.

If we put out of consideration the impairment of vision, a degree of squinting is, according to Richter, the only one symptom, which is inseparable from amaurosis. An obliquity of sight, accompanying the imperfect state of the disease, has also been particularly adverted to by Mr. Hey, of Leeds. (*Med. Observations and Inquiries, Vol. 5.*) The patient, says Richter, not only does not turn either eye towards any object, in such a manner, that the object looked at is in the axis of vision; but, he also does not turn both his eyes towards the same thing. This is alleged to be the only symptom, which we can trust, where implicit confidence should not be put in the mere assurance of the patient, that he cannot see, while all the coats and humours of the eye present their natural appearance. Provided this observation be correct, it must be highly interesting to the military surgeon, amaurosis being a common affliction of soldiers, many of whom, however, endeavour to avoid service by pretending to labour under a disease, which they well know does not necessarily produce any very considerable alteration in the natural appearance of the part affected.

The gutta serena originates with very various symptoms, and in exceedingly different ways. Richter thinks it probable, that this variety, attendant on the beginning of the disease, depends upon some difference in the cause of the complaint, and indicates the propriety of having variety in the modes of treatment. Sometimes, the patient loses his sight quite suddenly; while, in other instances, the power

of seeing diminishes so slowly, that months, and even years elapse, before the disease attains the worst degree. Sometimes, the gutta serena commences with several symptoms, which seem to betray an increase of sensibility in the eye, or some irritation affecting this organ. In moderately light places, the patient can discern things very well; but, in a great light, he is not able to see at all. The eye is sometimes so sensible, that a strong light will make it weep and become painful. Patients of this description ought always to wear a shade, however bad their sight may be. Sometimes the gutta serena originates with symptoms of weakness and diminished irritability. The sight is cloudy, and the patient finds that he can see better in a light, than a dark situation. He feels as if some dirt, or dust, were upon his eyes, and is in the habit of frequently wiping them. His power of vision is greater after meals, than at the time of fasting. His sight is always, for a short time, plainer, after the external use of tonic remedies, such as hartshorn, cold water, &c. Richter informs us of a person, who was nearly quite blind, but, was constantly able to see very well, for the space of an hour, after drinking champagne wine. He also mentions a woman, who had entirely lost her sight, who was in the habit of having it restored again, for half an hour, whenever she walked a quick pace up and down her garden. This author likewise acquaints us with the case of a lady, who had been blind for years; but, experienced a short recovery of her sight, on having a tooth extracted.

Sometimes, as Richter observes, the symptoms appear to indicate a preternatural accumulation of the humours of the eye. The patients complain of a tension of the eye-ball, which is often particularly irksome and distressing. Whenever such sensation is experienced, the eyesight becomes weak; and, on the subsidence of this feeling, the patient is again able to see better. The eye-ball feels hard, and occasionally is more or less enlarged, so that the state of the affected organ somewhat resembles that, which takes place in hydrophthalmia. (*See this Word.*) When a cataract is complicated with a gutta serena, the vitreous humour is sometimes found, in operating for the first disease, to be preternaturally thin, the eye being, as it were, in a dropsical state. Sometimes, the blood-vessels of the conjunctiva are varicose; the patient sees black specks, net-like appearances, streaks, snake-like figures, &c. It seems as if, in this case, the blood-vessels of the retina and choroides were in the same varicose state, as those of the conjunctiva, so as to make pressure

upon the first of these membranes. That the vessels are in reality thus dilated, says Richter, is rendered probable by the bleeding, which is apt to occur in the eye in operating for cataracts, complicated with the gutta serena.

In particular examples, the eye seems to be under the influence of some peculiar irritation. The patients see several objects, which are in motion, and of different colours, more especially, shining, fiery spots, flames, and rays of light. Sometimes, amaurosis arises after violent inveterate ophthalmies, and headachs. Certain patients, before being attacked with the complaint, are repeatedly afflicted with catarrhs, which cease as soon as the gutta serena is formed. According to Richter, the mucous membrane of the nose then becomes unusually dry and free from secretion. Some patients, of this kind, have been known to regain their sight, for a short time, on a copious discharge of mucus spontaneously taking place from the nose. Paying diligent attention to these various circumstances, attending the origin of the disorder, says Richter, will often be of great assistance to the practitioner, in enabling him to select a judicious method of treatment, when all other indications are absent.

The disease commonly makes its attack upon both eyes at once, and even in those occasional instances, in which only one is deprived of sight, the other rarely continues for a long time sound. The disorder generally extends over the whole eye; but, sometimes only a half of the organ is affected, the case being then named *amaurosis dimidiata*. In the first example, the patient is quite blind; in the second, he can discern the half of objects. Sometimes the malady seems to be confined to a single little spot in the eye, in which case, the patient is conscious of having before the retina an immoveable black speck. It is to this particular instance, that some pathologists apply the term, *scotomia*. Also patients, who may be said to be entirely blind, sometimes have a small part of the retina, which is still susceptible of the impression of light, and is usually situated towards one side of the eye. (*Hey, in Med. Observations and Inquiries, Vol. 5.*) Richter mentions, that, in one man, who was in other respects, entirely bereft of vision, this sensible point of the retina was situated obliquely over the nose, and so small, that it was always a considerable time, before its situation could be discovered: he adds, that it was so sensible, as not only to discern the light, but even the spire of a distant steeple. According to this author, it is the centre of the eye, that seems to be the first and most serious-

ly affected in the gutta serena. Hence, the generality of patients, who have a beginning imperfect amaurosis, can always see objects, laterally situated, better than those which are immediately before them.

The gutta serena is sometimes an intermittent disorder, making its appearance at regular or irregular intervals. In certain examples, as Richter remarks, the disease prevails at particular times, commonly all day, till a certain hour; or from one day till the next; or at a stated time every month. The attacks of the complaint sometimes take place at indeterminate periods. In particular cases, another morbid affection is associated with the impairment of sight. Richter mentions a man, who became blind at twelve o'clock in the day, when the upper eye-lid used also to hang down in consequence of being affected with paralysis. The attack always lasted twenty-four hours. On the following day, at twelve o'clock, the sight used to return, and the patient then suddenly regained the power of raising the upper eye-lid. He would continue thus able to see for the space of the next twenty-four hours. Whenever he took bark, the disease was regularly doubled; that is to say, the man then alternately remained blind forty-eight hours, and recovered the power of seeing for only twenty-four. In another patient, cited by this experienced surgical writer, the aqueous humour, during the blindness, always became discoloured, whitish, and turbid; but, its transparency regularly returned on the cessation of the attack. According to Richter, the periodical amaurosis commonly depends upon irritation affecting the digestive organs, the stimulus of worms, or irregularity in the menstrual discharge. Sometimes, it is plainly a symptom of a confirmed ague, the patient being attacked with an ordinary intermittent, and blind during each paroxysm; but, always regaining his sight as soon as each fit is over. (See *Richter's Anfangsgrunde der Wundarzneykunst, Band 3, Kap. 14.*)

Before treating of the different causes of the gutta serena, it seems proper to describe the ordinary symptoms of the disease. When the patient is first attacked, his sight gradually grows weaker; he feels, as if a gauze, or cob-web, were drawn over his eyes, and imagines he sees a white surface, studded with black specks, which he endeavours to wipe away. By degrees, the pupil of the eye loses its brilliancy, and distends itself much beyond the natural size; and if the patient's eye be closed, the upper eye-lid gently rubbed, and then suddenly opened, in a light place, the pupil will contract very little, or not at all. The sight grows weaker and

weaker; spectacles and convex glasses are of no service, and the patient, (generally speaking) sees worse in the open daylight, than in a dark situation. While the patient is at all conscious of the impression of the rays of light, or while a certain power of seeing still continues, the disease is called the *imperfect, or incomplete amaurosis*; but, when the patient is wholly insensible of the stimulus of light, the disorder is termed *perfect, or complete*.

Schmucker remarks, that, although the *complete gutta serena* is generally a gradual disease, there are cases, in which it comes on quite suddenly, without being preceded by the above-mentioned circumstances. These cases, he says, have frequently fallen under his observation, and been more easy of cure, than when the affliction has taken place in a more gradual way. In such instances, the sight is totally lost, the patient can distinguish no object whatever, the pupil of the eye is uncommonly enlarged, and if the eyelid be shut, and then rubbed, and opened in a strong light, the aperture in the iris remains fixed, and incapable of contraction. A lighted candle may be held to the patient's eyes, without exciting sensation. The pupil now loses its shining black gloss, and grows pale, so that a skilful practitioner can perceive the difference, without being close to the patient. Persons, attacked in this manner, usually have an unhealthy and timid look. (See *Schmucker's Vermischte Chirurgische Schriften, Band 2.*)

According to Richter, the remote causes of *gutta serena* may be properly divided into three principal classes, the differences of which indicate three general methods of treatment.

It is alleged, that the first class of causes seem to depend upon an extraordinary plethora and turgidity of the blood-vessels of the brain, or of those of the optic nerves and retina, upon which last parts a degree of pressure is thereby supposed to be occasioned. A considerable plethora, especially, when the patient heats himself, or lets his head hang down, will frequently excite the appearance of black specks before the eyes, and sometimes complete blindness. A plethoric person (says Richter,) who held his breath, and looked at a white wall, was conscious of discerning a kind of network, which alternately appeared and disappeared with the diastole and systole of the arteries. This phenomenon, it is conjectured, originated from the plethoric state of the vessels of the retina. Boerhaave mentions a man, who always lost

his sight on getting tipsy, and regained it on becoming sober.

Richter thinks it likely, that it is in this manner, that the disease is produced, by the suppression of some habitual discharge of blood, by not being bled according to custom, by the stoppage of the menses, and by the cessation of hemorrhage from piles; circumstances, which, if we can give credit to all the accounts of Richter, Scarpa, Schmucker, and other experienced writers on the subject, frequently give rise to the *gutta serena*. In the same manner, the complaint may be brought on by great bodily exertions, which must determine a more rapid current of blood to the head. Richter informs us of a man, who became blind, all on a sudden, while carrying a heavy burden up stairs. He tells us of another man, who laboured excessively hard, for three days in succession, exerting his strength very much, and who became blind at the end of the third day. Pregnant women, in like manner, are sometimes bereft of their sight during the time of labour. Schmucker has recorded a remarkable instance of this in a strong young woman, thirty years old, and of a full habit. Whenever she was pregnant, she was troubled with violent sickness, till the time of delivery, so that nothing would stop in her stomach. She was bled, three or four times, without effect. Towards the ninth month, her sight grew weak, and for eight or ten days before parturition, she was quite blind. The pupil of the eye was greatly enlarged, but, retained its shining black appearance. She recovered her sight immediately after delivery, and did not suffer any particular complaints. Schmucker assures us, that he has been three times a witness of this extraordinary circumstance. (*Vermischte Chir. Schriften, Band 2, p. 6, edit. 1786.*) Richter speaks of a person, who lost his sight, during a violent fit of vomiting. Schmucker acquaints us, that it is not uncommon for soldiers, who are performing forced marches in hot weather, to become blind all on a sudden. All great exertions of strength, when the body is plethoric, or heated, or bent forwards with the head in a low posture, are usually attended with some dangers of bringing on amaurosis.

The blindness, which follows external injuries of the head, is ranked by Richter among the preceding class of cases. A man, who received a smart box on the ear, says this author, lost his sight on the spot. Richter conceives it probable, that a concussion of the head may sometimes produce an atony of the blood-vessels, giving rise to their dilatation, and consequent pressure on the adjacent

nerves: perhaps, it is more likely, that the blow itself actually ruptures them, and produces an effusion of blood. Richter suspects, that the gutta serena, which originates during a violent ophthalmia, or during a severe inflammatory fever, may be of the same nature. He thinks it probable, that persons, who become blind while exposing themselves to the burning sun with their heads uncovered, have their sight impaired in a similar way.

The diagnosis of this first species of the gutta serena is founded on an acquaintance with the preceding remote causes, which are for the most part very evident, as the blindness, which is the consequence of them, follows with remarkable quickness.

The second class of causes are supposed to operate, by weakening either the whole body, or the eye alone, and they indicate the general, or topical use of tonic remedies. In the first case, the gutta serena appears as a symptom of considerable universal debility of the whole system; in the second case, the disease is altogether local. Every great general weakness of body, let it proceed from any cause whatsoever, may be followed by a loss of sight. The gutta serena, if we can give credit to the statement of Richter, has sometimes been the consequence of a tedious diarrhœa, a violent cholera morbus, profuse hemorrhage, and immoderate salivations. He informs us of a dropsical woman, who became blind, on the water being let out of her abdomen. According to the same author, no general weakening causes operate upon the eyes, and occasion total blindness, so powerfully and often, as premature and excessive indulgence in venereal pleasures.

The causes are various, which operate locally in weakening the eyes. Nothing has a greater tendency to debilitate these organs, than keeping them fixed very attentively, for a long while, upon minute objects. But, however long and assiduously objects are viewed, if they are diversified, the eye suffers much less, than when they are all of the same kind. A frequent change, in the objects, which we look at, has a material effect in strengthening and refreshing the eye. The sight is particularly injured by looking at objects with only one eye at a time, as is done with telescopes and magnifying glasses; for when one eye remains shut, the pupil of that, which is open, always becomes dilated beyond its natural diameter, and lets an extraordinary quantity of light into the organ. The eye is generally very much hurt, by being employed in the close inspection of brilliant, light-coloured, shining objects. They are greatly mis-

taken, says Richter, who think, that they save their eyes, when they illuminate the object, which they wish to see, in the evening, with more lights, or with a lamp, that intercepts and collects all the rays of light, and reflects them upon the body, which is to be looked at. Richter makes mention of a man, who, in the middle of winter, went a journey on horseback, through a snowy country, while the sun was shining quite bright, and who was attacked with amaurosis. He speaks of another person, who lost his sight, in consequence of the chamber, in which he lay, being suddenly illuminated by a vivid flash of lightning. A man was one night seized with blindness, while he had his eyes fixed on the moon in a fit of contemplation. Richter also expresses his belief, that a concussion of the head, from external violence, may sometimes operate directly on the nerves, so as to weaken and render them completely paralytic.

The third class of causes consist of irritations, which, in some inexplicable way, directly, or, probably, for the most part, directly, affect the optic nerves, and render them insensible of the impression of the light. Most of these irritations are asserted to lie in the abdominal viscera, whence they sympathetically operate upon the eyes. The observations of Richter, Scarpa, and Schmucker, all tend to confirm, that amaurosis more frequently arises from irritation in the gastric organs, than any other cause whatever. It may often be ascertained that patients with amaurosis have suffered much trouble, and long grief, or been agitated with repeated vexations, anger, and other passions, which are supposed to have a great effect in disordering the bilious secretion, and the digestive functions in general. Richter tells us of a man, who lost his sight, a few hours after being in a violent passion, and recovered it again the next day, upon taking an emetic, by which a considerable quantity of bile was evacuated. A woman is also cited, who became blind, whenever she was troubled with what are termed, acidities in the stomach. (See *Anfangsgrunde der Wundarzneykunst*, Band 3, Kap. 14.)

The continental surgeons are excessively comprehensive in their ideas of the causes of the gutta serena, and, with many truths, they blend an evident quantity of unestablished conjectures, and palpable absurdities. I believe, it will generally be found, that, when surgical writers assign a multitude of causes for any disease, they deal very much in mere supposition. It would be idle credulity, indeed, to put faith in the assertions concerning the amaurosis being occasioned by the bad treat-

ment of particular fevers, suppressed diarrhoeas, the repulsion of eruptive complaints, &c. There is no reason, why a person should not become blind about the time, when another disorder gives way; but, we ought to have some other ground for the doctrines, to which allusion is made, before we can presume to offer them as entitled to confidence.

Worms in the alimentary canal are alleged to be sometimes the cause of amaurosis, and, since a disordered state of the gastric organs is universally acknowledged to be frequently concerned in the production of blindness, we can have no difficulty in conceiving, that worms may likewise have the same effect. Besides gastric irritations, there are some others, which class as causes of this disease. A violent fright, which is considered as being a frequent remote cause of the gutta serena, is supposed by Richter to operate chiefly by irritating the nerves.

The blindness sometimes proceeds from a mechanical kind of irritation. A man received in his right orbit a small shot, which pierced the upper eye-lid, and lodged at the upper part of the socket, between the eye-lid and eye-ball, so that it could be felt externally. Richter adds, that this patient shortly afterwards became blind in the left eye; but recovered his sight in it again, upon the excision of the shot. (*Anfangsg. der Wundarzn. Band 3, p. 439.*)

Sometimes, says this experienced surgeon, the irritation, exciting amaurosis, seems to have its seat in the mucous membrane of the nose and frontal sinuses. We have already adverted to the unusually dry state of the nostril, that has been suspected of being occasionally conducive to this species of blindness.

The gutta serena is generally difficult of cure. However the degree of difficulty in relieving the disease varies in different cases, according to the way in which the malady originates, and the nature of the cause.

Professor Scarpa, of Pavia, has given an excellent account of the prognosis in cases of amaurosis. Some of his doctrines, however, founded on the humoral pathology, are hypothetical, and, consequently, are purposely omitted in the following account. It also deserves notice that the case supposed to originate from injury of the supra-orbitary nerve, is not always incurable, as the experience of Hey confirms. (*See Med. Obs. and Inq. Vol. 5.*)

Amaurosis is divided by Scarpa into the *perfect*, or *imperfect*; *inveterate* or *recent*; and *continued*, or *periodical*.

The *perfect*, *inveterate* *amaurosis*, attended with organic injury of the substance, constituting the immediate organ of sight,

says Scarpa, is a disease absolutely incurable. The *imperfect*, *recent* *amaurosis*, particularly that which is *periodical*, is commonly curable; for, it is mostly sympathetic with the state of the stomach and *primæ viæ*, or dependent on causes, which though they affect the immediate organ of sight, are capable of being dispersed, without leaving any vestige of impaired organization in the optic nerve, or retina.

When amaurosis has prevailed several years, in persons of advanced age, whose eyesight has been weak from their youth; when it has come on slowly, at first with a morbid irritability of the retina, and then with a gradual diminution of sense in this part, till total blindness was the consequence; when the pupil is motionless, not circular, and not much dilated; when it is widened in such a degree, that the iris seems as if it were wanting, and the margin of this opening is irregular and jagged; and, when the bottom of the eye, independently of any opacity of the crystalline lens, presents an unusual paleness, like that of horn, sometimes partaking of green, and reflected from the thickened retina, the disease may be generally set down as incurable. Cases may be deemed irremediable which are attended with pain all over the head, and a continual sensation of tightness in the eye-ball, which are preceded by a violent, protracted excitement of the nervous system, and then by general debility, and languor of the constitution, as after masturbation, premature venery, and hard drinking. There is no remedy for cases, connected with epileptic fits, or frequent spasmodic hemiplegia; nor for such as are the consequence of violent, long-continued, internal ophthalmia. Cases are incurable, also, when produced by violent concussions of the head, direct blows on the globe of the eye, or a violent contusion, or other injury of the supra-orbitary nerve, and this, whether the disease take place immediately after the blow, or some weeks subsequently to the healing of the wound of the eyebrow. Amaurosis is also incurable, when occasioned by foreign bodies in the eye-ball, lues venerea, or exostoses about the orbit. Lastly, amaurosis is absolutely irremediable, when conjoined with a manifest change in the figure and dimensions of the eye-ball.

On the contrary, all cases of imperfect, recent amaurosis, whether the blindness be total or partial, are mostly curable, when not produced by causes, capable of contusing or destroying the organic structure of the optic nerve, and retina. This is especially true, when the retina is in some degree sensible to the impression of light. Recent, sudden cases, in which the

pupil is not excessively dilated, and its disk remains regular, while the bottom of the eye is of a deep black colour; cases, unaccompanied with any acute, continual pain in the head and eye-brow, or any sense of constriction in the globe of the eye itself; cases, which originate from violent anger, deep sorrow, fright, excessive fullness of the stomach, a foul state of this viscus, general plethora, or the same partial affection of the head, suppression of the menses, habitual bleedings from the nose, piles, &c. great loss of blood, nervous debility, not too inveterate, and in young subjects, are all, generally speaking, curable. Amaurosis is also, for the most part, remediable, when produced by convulsions, or the efforts of difficult parturition; when it arises during the course, or towards the termination of acute, or intermittent fevers; and when periodical, coming on at intervals, such as every day, every three days, every month, &c.

Before entering into the consideration of the treatment of the gutta serena, I shall take this opportunity of noticing a few remarkable circumstances, which are connected with the disease.

It sometimes happens, that, when a patient shuts one eye, he can only half distinguish objects; but, that if he opens both eyes, he sees every thing in its natural form. In this case, according to Schmucker, one eye is sound, and only some fibres of the nerve of sight are injured in the other.

In the gutta serena, which comes on gradually, the patient also sometimes sees double, with both eyes. Some years ago, Schmucker cured a major of hussars, who saw the three lines of his squadron double; and the same surgeon was ordered by the king of Prussia to attend a gentleman, who was afflicted in a similar way. In the opinion of this eminent surgeon, such cases are brought on by a violent distention of the vessels of the choroides, where he thinks, that varices may easily arise, in consequence of the weak resistance of that membrane. In this manner, the filaments of the retina suffer pressure, and the rays of light are broken. Under these circumstances, if prompt assistance be not afforded, total and frequently incurable blindness may be the consequence. Schmucker met with an example of such an irremediable amaurosis, (the only instance in his practice), in a young man, twenty-six years of age. When the patient made application for the advice of the foregoing surgeon, he had been blind a year. Before he lost his sight, he remarked, that, after any violent emotion, his sight at first grew weak, and that objects afterwards appeared double. When his circulation

was at all hurried, he saw black spots before his eyes, and, at length, was quite blind. The vessels of the choroides were as large, as if they had been injected with wax, and every kind of surgical assistance proved ineffectual.

I have already adverted to the occasional moveableness of the iris, notwithstanding the insensible state of the retina. Let me next take notice of a case, which sometimes presents itself, and is quite the reverse of this last. The nerves of the iris may be paralytic, while those of sight continue unimpaired. Schmucker tells us, he was acquainted with a woman, whose pupil was uncommonly distended, and totally incapable of motion. Her sight was very weak, and spectacles were of no use to her. She could scarcely discern any thing by day, or in a strong light; but, she could see rather better at night and in dark places. This infirmity of sight depended upon the dilated, paralytic state of the pupil, by which too many rays of light were admitted into the eye; and the reason, why the patient could see better at night, was, because the pupil, in its natural state, always becomes widened and dilated in a dark situation. (See *Vermischte Chirurgische Schriften, Von J. L. Schmucker, Band 2, p. 13, 14.*)

TREATMENT OF AMAUROSIS, OR THE GUTTA SERENA.

Here the first endeavour of the practitioner should be to find out and remove the cause of the disease. This is the surest and best way of proceeding; but, it is worthy of notice, that sight does not invariably return, although the real cause of the blindness has been radically removed. In such cases, the continuation of the loss of sight is ascribed to the torpor of the nerves, which have been for a considerable time without action, and have been impaired by the disease. The practitioner usually prescribes stimulants and tonics, with a view of bringing the nerves into their original state of activity. In other cases, sight returns as soon as the cause of the disease is removed. When it is found impossible to make out any thing, respecting the cause of the disorder; the surgeon should found the curative indications upon the symptoms and appearances, which have taken place in the origin and course of the disease, and from which symptoms some conjectures may be drawn, in regard to the nature of the case. When no appearances of this kind occur, and nothing can be learnt about the cause of the malady, the surgeon must have recourse to such empirical remedies, as extensive experience has shewn to be sometimes truly capable of removing the affection, although

an explanation cannot always be given of the manner, in which they operate.

We shall follow Richter, and first treat of that method of cure, which is directed against the causes of the disease, and which, whenever circumstances will admit of its adoption, must be regarded as the most proper and scientific.

In that species of amaurosis, which arises from the first class of causes, namely, from those, which seem to induce the disease, by means of a preternatural fulness and dilation of the blood vessels of the brain, or eye, the indication is evidently to lessen the quantity of blood, and diminish the determination of it to the head. For this purpose, the patient may be bled in the arm, temporal artery, or foot. This evacuation is to be repeated as often as seems necessary, and it will be better to begin with taking away from twelve to sixteen ounces. We are also advised by Schmeucker to apply ten or twelve leeches to the neck and temples. The efficacy of bleeding, in the cure of particular cases of the gutta serena, is strikingly exemplified by numerous well authenticated observations. Richter informs us of a woman, who, on leaving off having children, lost her sight; but, recovered it again by being only once bled in the foot. A spontaneous hemorrhage from the nose also cured a young woman, who had been blind for several weeks. (*Anfangsgrunde der Wundarzneykunst. Band 3, p. 442*.)

General bleeding sometimes proves ineffectual, unless assisted by topical. Leeches may be applied to the temples, or cupping glasses to the back part of the neck. When the disorder seems to be connected with an interruption of the menses, or the cessation of bleeding from piles, leeches may be put on the perinæum, the inside of the thigh, or the sacrum. Local bleeding, however, seldom avails, except the whole mass of blood has been previously diminished by a prudent employment of the lancet. Besides bleeding, the surgeon may advantageously have recourse to other means at the same time, as, for instance, emollient glysters, purgatives, blisters, bathing the feet in warm water, &c.

In some cases all the foregoing means fail in producing the desired benefit, even when they have been followed up, as far as the state of the pulse, and strength of the constitution will allow. Here the continuance of the disease may depend, either upon the stoppage of some wanted evacuation of blood, or else upon some other cause of the first class. In the first of these cases, (says Richter) experience shews, that the disease will sometimes not give way, before the accustomed discharge is re-established, on which the malady de-

pends, notwithstanding evacuations may be employed in any way whatsoever. A woman, who (as this author acquaints us) had lost her sight, in consequence of a sudden suppression of the menses, did not recover it again till three months after the return of the menstrual discharge, notwithstanding every sort of evacuation was tried. He also tells us of another woman, who had been blind half a year, and did not menstruate, and to whose external parts of generation leeches were several times applied. As often as the leeches were put on, (says Richter) the menses in part recommenced; and, as long as they made their appearance, which was seldom above two hours, the woman always enjoyed a degree of vision. (*Anfangsgrunde der Wundarzneykunst, Band 3, p. 443.*)

For the amaurosis, arising from suppression of the menses, Scarpa recommends leeches to the labia pudendi, bathing the feet in warm water, and afterwards exhibiting an emetic, and the resolvent pills, of which I shall presently speak. If these means fail in establishing the menstrual discharge, he says, great confidence may be placed in a stream of electricity, conducted from the loins across the pelvis, in every direction, and thence repeatedly to the thighs and feet. He enjoins us not to despair at want of success at first, as the plan frequently succeeds, after a trial of several weeks.

For the amaurosis, proceeding from the stoppage of an habitual copious bleeding from piles, Scarpa recommends the application of leeches and fomentations to the hemorrhoidal veins, then giving the patient an emetic, and, afterwards the resolvent pills. (*Saggio di Osservazioni e d'esperienze sulle principali malattie degli occhi, cap. 19.*)

When the disease does not appear to originate from the stoppage of any natural or habitual discharge of blood, and does not yield to the evacuating plan, Richter thinks, that the surgeon is justified in concluding, that the preternaturally dilated vessels have not regained their proper tone and diameter, and that he ought to employ topical corroborant remedies, particularly cold water. Richter, in this kind of case, is an advocate for washing and bathing the whole head with cold water, especially, the part about the eyes; a method, he says, which may often be practised, after evacuations, with singular and remarkable efficacy.

When the return of sight cannot be brought about in this manner, Richter advises us to try such means, as seem calculated to stimulate the nerves, and remove the torpid affection of the optic nerves in particular. Of these last reme-

dies, says he, emetics are the principal and most effectual. Soldiers, who lose their sight in performing forced marches, in hot weather, very commonly have it re-established again, by being immediately bled, and taking an emetic the next day. (See *Schmucker's Chirurgisch Wahrnehmungen* 1. Theil.)

We come now to the consideration of that species of the gutta serena, which is regarded as the effect of some unnatural irritation. Here, according to the precepts delivered by Richter, we should endeavour to discover what the particular irritation is, and then endeavour to effect its removal. When it cannot be exactly detected, we are recommended generally to employ such remedies, as will lessen the sensibility of the nerves, and render them less apt to be affected by the irritation, of whatever kind it may be.

Sometimes the irritation is both discoverable and removeable, and still the effect, that is to say, the blindness continues. In this circumstance, Richter thinks, that the surgeon should endeavour to obviate the impression, which the irritation has left upon the nerves, by the use of anodynes, or, else, he is of opinion, that the practitioner should try to remove the torpor of the nerves by the employment of stimulants.

But, according to Schmucker, Richter, and Scarpa, the curable imperfect amaurosis commonly depends on some disease, or irritation, existing in the gastric system, and, in some instances, complicated with general nervous debility, in which the eyes participate. Hence, the chief indication, in the majority of cases, is to free the stomach and primæ viæ from all irritating matter, to strengthen the gastric organs, promote digestion, and reanimate the nervous system in general, and the nerves of the eye in particular.

Emetics and internal resolvents answer the first purpose, and tartar emetic should be preferred to every pharmaceutical preparation. When afterwards administered, in small repeated doses, it also acts as a resolvent remedy, which operation may be rendered stronger by joining it with gummy saponaceous substances.

Dissolve three grains of the antimonium tartarizatum, for an adult, in six ounces of water, and give a spoonful of this solution, every half hour, until nausea and copious vomiting are produced. The next day exhibit some resolvent powders, consisting of an ounce of cream of tartar, and one grain of tartar emetic, divided into six equal parts. The patient must take one of these in the morning, another four hours afterwards, and a third in the evening, for

eight or ten days in succession. This remedy will create a little nausea, a few more alvine evacuations, than usual, and, perhaps, in the course of a few days, vomiting. If the patient, during the use of these resolvent powders, should make vain efforts to vomit, complain of bitterness in his mouth, loss of appetite, and no renovation of sight, the emetic, as at first directed, is to be prescribed again. This is to be repeated a third, and fourth time, should the morbid state of the gastric system, the bitter taste in the mouth, the tension of the hypochondria, the acid eructations, and the inclination to vomit, make it necessary. The first emetic often produces only an evacuation of an aqueous fluid, blended with a little mucus; but, if it be repeated, a few days after the resolvent powders have been administered, it then occasions a discharge of a considerable quantity of a yellow, greenish, matter, to the infinite relief of the stomach, head, and eyes.

The stomach having been thus emptied, Schmucker's, or Richter's, resolvent pills are to be ordered.

These are composed as follows :

℞ Gum. Sagapen.	} an. ʒj
Galban.	
Sap. Venet.	
Rhei optim. ʒiss	
Tart. Emet. gr. xvi.	
Suc. liquerit ʒj	fiant pilulæ gran. quingue.

Three of these pills to be taken every morning and evening for a month, or six weeks.

℞ Gum. Ammoniac.	} an. ʒij
Ass. fœtid.	
Sap. Venet.	
Rad. Valer. s. p.	
Summit. Arnicæ.	
Tart. Emet. gr. xvij.	fiant pilulæ gran. quingue.

Six to be taken thrice a day for several weeks.

The pills are here directed to be made larger, than Schmucker and Richter order, that the number in one dose may be diminished. To prescribe 15 pills three times a day would seem absurd to the generality of patients in this country.

The following are the usual effects. The patient, after having vomited copiously, experiences a general calm, and an easiness not felt before. Sometimes, he begins to distinguish the outlines of objects the very day on which he takes the emetic; at other times, he does not reap this benefit till the fifth, seventh, or tenth day; and, in some instances, not before some weeks have elapsed, after the exhibition

of the emetic, and the uninterrupted use of the resolvent powders and pills. When the patient begins to recover his sight, the dilated state of the pupil diminishes; the iris contracts more on being exposed to the vivid light of a candle; and, in proportion as the power of seeing things increases, the contraction and moveableness of the pupil augments. On the whole, the cure is very seldom completed in less than a month, during which time the employment of such remedies, as are calculated to revive the languid action of the nerves of the eye, must not be neglected.

When the above plan has rectified the state of the stomach, and partly effected the restoration of sight, such remedies must be employed, as strengthen the digestive organs, and excite the vigour of the nervous system in general, and of the nerves of the eye in particular. A powder is to be prescribed, composed of an ounce of bark, and half an ounce of valerian, divided into six equal parts, one of which is to be taken in the morning, and another in the evening, in any convenient vehicle, for, at least, five or six weeks. During this time, the patient's nourishment must consist of tender succulent meat, and wholesome broths, with a moderate quantity of wine, and proper exercise in a salubrious air. To excite the action of the nerves of the eye, the vapour of the aqua ammoniac puræ; properly directed against the eye, is of the greatest service. This remedy is applied by holding a small vessel, containing it, sufficiently near the eye to make this organ feel a smarting, occasioned by the very penetrating vapours, with which it is enveloped, and which cause a copious secretion of tears, and a redness, in less than half an hour after the beginning of the applications. It is now proper to stop, and repeat the application, three or four hours afterwards. The plan must be thus followed up till the incomplete amaurosis is quite cured. The ammoniacal vapours should be used as soon as the stomach has been freed from all irritating matter, and they should not be discontinued, till long after the eye has been cured.

The operation of these vapours may be aided by other external stimulants, applied to such other parts of the body, as have a great deal of sympathy with the eyes. Of this kind, are blisters to the nape of the neck; friction on the eye-brow with the anodyne liquor; the irritation of the nerves of the nostrils by sternutative powders, like that composed of two grains of turbith mineral, and a scruple of powdered betony leaves; and, lastly, a stream of electricity. The latter has been proposed, as one of the principal means of curing

amaurosis; but, experience has shewn, that electricity only merits confidence, as a secondary remedy, and Mr. Hey, one of its most zealous advocates, confesses, that it only succeeds in cases of recent amaurosis, and, usually, not in these, unless it be combined with proper internal medicines, among which resolvents are the chief. (*Med. Obs. and Inq. Vol. 5, p. 26.*)

Many might suppose bark to be a specific for the imperfect periodical amaurosis. This, however, is not the case. Bark, which is efficacious in intermittent fevers, and other periodical diseases, far from curing the periodical amaurosis, seems to exasperate it, rendering its return more frequent, and of longer duration, than before. On the other hand, this disease is most commonly cured, in a very short time, by exhibiting first emetics, then internal resolvents, and lastly, corroborants, and even bark, which was before useless and hurtful.

The above plan of curing the recent imperfect amaurosis succeeds in the majority of cases, when the disease is only sympathetic, or dependent on the morbid state of the gastric system. But, there are cases, in the formation of which many other causes operate, besides the most frequent one already stated. These demand the employment of particular curative means, in addition to those which have been already described. Such is, for example, the imperfect amaurosis, which occurs suddenly, in consequence of the body being excessively heated, or exposure to the sun, or violent anger, in plethoric subjects. This case requires, in particular, general and topical evacuations of blood, and the application of cold washes to the eyes and whole head. An emetic should next be given, and afterwards a purge of the kali tartarisatum, or small repeated doses of the tartar emetic. Schmucker relates, that, by means of bleeding and an emetic, he has oftentimes restored the eye-sight of soldiers, who had lost it in making forced marches, with very heavy burdens. In amaurosis, suddenly occasioned by violent anger, an emetic is the more strongly indicated after bleeding, as the blindness, thus arising, is always attended with a bitter taste in the mouth, tension of the hypochondria, and continual nausea. Richter gives an account of a clergyman, who became completely blind, after being in a furious passion, and whose eye-sight was restored the very next day, by means of an emetic, which was given with a view of relieving some obvious marks of bilious disorder in the stomach.

The treatment of the imperfect amaurosis, from fevers badly treated, deep sorrow, great loss of blood, intense study,

and forced exertions of the eyes on very minute, or brilliant objects, consists also in removing all irritation from the stomach, and afterwards strengthening the nervous system in general, and the nerves of the eye in particular. In the case originating from fevers, the emetic and resolvent pills are to be given; then bark, steel medicines, and bitters; while the vapours of the aqua ammoniæ puræ are applied to the eye itself.

When the disorder seems to proceed from grief, or fright, the stomach and intestines are to be emptied by means of tartar emetic, and the resolvent pills; and the cure is to be completed by giving bark and valerian together; by applying the vapour of the aqua ammoniæ puræ to the eye; ordering nourishing easily digestible food; diverting the patient's mind, and fixing it on agreeable objects, and recommending moderate exercise. The amaurosis from fright is said to require a longer perseverance in such a plan, than the case from sorrow. (*Scarpa's Osservaz. Cap. 19.*)

The third species of gutta serena, or that which arises from debilitating causes, is of two kinds; in one, the disease is the consequence of a general weakness of the body; in the other, it is the effect of a debility, which is confined to the eye itself, and does not extend to the whole constitution.

According to Scarpa, the incomplete amaurosis from general nervous debility, copious hemorrhage, convulsions, ab inatione, and long continued intense study, especially, by candle light, is less a case of real amaurosis, than a weakness of sight from a fatigued state of the nerves, especially of those constituting the immediate organ of sight. When this complaint is recent, in a young subject, it may be cured, or diminished by emptying the alimentary canal with small repeated doses of rhubarb, and then giving tonic cordial remedies. At the same time, the patient must abstain from every thing, that has a tendency to weaken the nervous system, and consequently, the eye-sight. After emptying the stomach, prescribe the decoction of bark, with valerian, or the infusion of quassia, with the addition of a few drops of the æther vitriolicum to each dose, with nourishing, easily digestible food. The aromatic spirituous vapours (mentioned in the article *Ophthalmia*) may then be topically applied; or if these should prove ineffectual, the vapour of the aqua ammoniæ puræ. The patient must take exercise on foot, horseback, or in a carriage, in a wholesome dry air, in warm weather, and take advantage of sea bathing. He must avoid all thoughts of care,

and refrain from fixing his eyes on minute shining objects. In proportion as the energy of the nervous system returns, and the constitution is strengthened, the sight is restored. In order to preserve, and improve this useful sense, the patient must adopt, above all things, every measure, calculated to maintain the tone of the stomach, and moderate the impression of light on the retina. This object can easily be obtained by always wearing flat green glasses before the eyes, in a vivid light. (*Saggio di Osservaz. Cap. 19.*)

When the weakness is confined to the eye alone, Richter thinks the topical employment of corroborant applications alone necessary. Bathing the eye with cold water, says he, is one of the most powerful means of strengthening the eye. The patient should dip in cold water a compress, doubled into eight folds, and sufficiently large to cover the whole face and forehead, and this he should keep applied, as long as it continues cold. Or, else, he should frequently apply cold water to his eyes and face with his hand, on a piece of rag. In these cases, Richter does not approve of employing eye-glasses; he objects to their smallness, from which the eye soon makes the fluid warm, or presses the greater part of it out.

The eye may also be remarkably strengthened by repeatedly applying blisters of a semi-lunar shape above the eye-brows, only allowing the plaster, however, to remain just long enough to excite redness. Richter likewise speaks favourably of rubbing the upper eyelid, several times a day, with a mixture of the tinctura cantharidum, and spiritus serpilli, great care being taken, that none of the application come into contact with the eye itself. All spirituous and aromatic remedies are also proper. The infusum valerianæ et salviæ, with a proportion of camphorated spirit, and the oleum cajeputi, are likewise enumerated, as useful and efficacious liniments. (*Anfangsgrunde der Wunderzneykunst, Band 3, p. 452.*)

When no probable cause whatsoever can be assigned for the disease, the surgeon is justified in employing such remedies, as have been proved by experience to be sometimes capable of relieving the affection, although upon what principle is utterly unknown. The chief means of this kind are emetics, given in small doses, so as to excite nausea, and occasionally in larger ones to occasion vomiting. A simple solution of two grains of the antimonium tartarizatum in a few ounces of water, taken by spoonfuls, frequently proves productive of remarkable benefit. Experience is also highly in favour of giving a trial to Schmucker's pills, the

composition of which has been already described. The operation of these pills may be greatly assisted with the exhibition of arnica and valerian, sixteen grains of which should be taken every morning and evening, and the dose be gradually increased. The leaves and flowers of arnica, in an infusion, or else in powder, have been found efficacious. Of the last, at first ten grains, afterwards gradually increased to half a dram, may be prescribed every two, or every four hours.

Mercury also deserves trial, and its administration may be pushed till the patient begins to be salivated. This mineral may be tried either alone, or in conjunction with other medicines, as sarsaparilla, cicuta, or sulphur auratum antimonii.

Valerian alone, in the form of powder, and in the dose of half a dram, two or three times a day, may also be tried. Or this medicine may be joined with the decoction of bark, containing either some of the ammonia præparata, or a proper proportion of the spiritus ætheris vitriolici compositus. Stork has recommended pulsatilla, in the form of an extract, of which from half a grain to two grains is to be taken with sugar, or antimonial wine; or else an infusion of this plant may be given. The extractum hyoscyami albi is said to be often serviceable, either alone, in the dose of from two to eight grains, or together with antimonial wine. A sort of tincture of millepedes is among the empirical remedies in repute on the continent. Hemlock is another celebrated remedy. So is the powder of belladonna, given in the dose of five grains a day. The ammonia præparata, in the dose of a scruple, once a day, is likewise praised. Externally, the aqua ammoniæ acetatæ, mixed with sage, or setwell tea, has been spoken favourably of, as a collyrium. A mixture of oleum castorei and hartshorn, in equal parts, may be taken inwardly; in the dose of forty drops, and also rubbed upon the upper eyelid and eyebrow. Warner exhibited the oleum animale and musk.

The application of sternutative powders to the nostrils, is, perhaps, to be regarded as a mode of treatment, established on empirical principles, unless, indeed, we can place confidence in the statement of Schmucker and Richter, that an unusual dryness of the mucous membrane of the nose, following tedious and severe catarrhs, may have the effect of inducing amaurosis. The snuff, employed by Schmucker, is thus composed: ℞ Mercur. viv. ʒj. Sacchar. alb. ʒiij, Lill. Alb. Rad. Valerian. ā ā ʒj. Misce.

Mr. Ware has written in favour of the efficacy of electricity and a mercurial

snuff in cases of gutta serena. The snuff is compounded of ten grains of turbith mineral (*hydrargyrus sulphuratus*) well mixed, with about a dram of the pulvis sternutatorium, glycyrrhiza, or common sugar. A small pinch of this snuff, taken up the nose, is found to stimulate it very considerably—sometimes exciting sneezing, but, in general producing a very large discharge of mucus.

Mr. Ware has observed, that the pupil has been generally dilated, in the cases benefited by electricity. He notices, however, that there are many instances in which a contraction of the pupil is the only change, which takes place, in the appearance of the eye. In this sort of case, the impairment of sight is usually preceded by severe pain, and the original cause may be an internal ophthalmia of long continuance. The crystalline is sometimes visibly opaque. Here electricity has been found useful; but, Mr. Ware states, that, in these instances, the sublimate has proved superiorly and more certainly efficacious, and, consequently, he prefers it to all external applications whatever. He recommends 1-fourth of a grain, as a quantity proper for a common dose, and says, that it agrees best with the stomach when first dissolved, as Van Swieten directs, in half an ounce of brandy, and taken in a basin of sago or gruel. For young patients the dose must be diminished in proportion to their youth. The medicine is to be continued, as uninterruptedly as the constitution will allow, for a month, six weeks, or even longer.

Electricity is said to have proved more strikingly useful, in cases of amaurosis, originating from lightning, than when the disease has arisen from any other cause. Mr. Ware relates a very interesting instance of the success of electricity, in a case, which came on very suddenly, after great pain in the teeth, and a swelling of the face had gone off. The disorder came on more suddenly; the temporary blindness was more entire; the eye-lids were more affected, and the cure more speedy, than in the instances related by Mr. Hey in the 5th vol. of the Med. Obs. and Inq. (*Chirurgical Observations relative to the Eye*, by James Ware, Vol. 1.)

With the exception of one case related by Valsalva, Scarpa was unacquainted with any instance of amaurosis, arising from a wound of the eye-brow, that was relieved, and he has therefore, set down this species as incurable. The opinion, however, is not perhaps correct, for, the first case related by Mr. Hey arose from this cause, and was cured by giving every night the following dose: ℞ Calomel. pp. Camphor ā ā iij. Conserv. Cynob. q. s.

præbe misceant et f. Bolus, in conjunction with electricity. The lady, however, had been previously bled twice, had taken some nervous medicines, and had had a blister between the shoulders. The patient was first set upon a stool with glass feet, and had sparks drawn from the eyes, and parts surrounding the orbits, especially, where the superciliary, and infra-orbital branches of the fifth pair of nerves spread themselves. After this operation had been continued half an hour, she was made to receive, for an equal time, slight shocks through the affected parts. In a few days sight began to return, and in less than three months it was quite restored.—In another case, one grain of calomel, and two of camphor, given every night, and the employment of electricity, effected a cure. The disease had come on gradually, without any previous accident, or pains in the head. The patient a boy nine years old.

There are several other very interesting cases of amaurosis related by Mr. Hey, all of which make electricity appear a most efficacious remedy, though it is true, as Scarpa observes, that, in most of these instances, internal medicines, were also given, and bleeding occasionally practised. Mr. Hey attributes the benefit chiefly to the electricity, because, in two of his cases, no medicines were used, yet the progress of the amendment seemed to be as speedy in them, as in the rest, and in two instances, a degree of sight was obtained by the first application of electricity.

Mr. Hey makes particular mention of an obliquity of sight, as invariably attendant on amaurosis. It was most remarkable in those, who had totally lost the sight of either eye, for, in them, the most oblique rays of light seemed to make the first sensible impression upon the retina; and in proportion as that nervous coat regained its sensibility, the sight became more direct and natural. (*Med. Obs. and Inq. Vol. 5.*)

Many of the causes of amaurosis are of such a nature, as to render the disease totally incurable. Bonetus, in his *Sepulchretum Anatomicum*, lib. 1. sect. 18. has given us several such cases: after death, the blindness in one was found to be occasioned by an encysted tumour weighing fourteen drams, situated in the substance of the cerebrum, and pressing on the optic nerves near their origin. In a second, the blindness was produced by a cyst, containing water, and lodged on the optic nerves, where they unite. In a third, it arose from a caries of the os frontis, and a consequent alteration in the figure of the optic foramina. In a fourth, the cause of the disease was, a malformation of the optic nerves themselves. In some of the in-

stances, in which no apparent alteration can be discovered in the optic nerve, Mr. Ware conjectures, whether a dilatation of the anterior portion of the circulus arteriosus may not be a cause of the affection. The circulus arteriosus is an arterial circle, surrounding the sella turcica, formed by the carotid arteries on each side, branches passing from them to meet each other before, and other branches passing backwards, to meet branches from the basilar artery behind. The anterior part of the circulus arteriosus lies directly over, crosses, and is in contact, with the optic nerves, just in the same way as the anterior branches lie over the optic nerves, the posterior ones lie over the nervi motores oculorum. Hence Mr. Ware attempts to refer the amaurosis itself, and the paralytic affection of the eye-lids, and muscles of the eye, sometimes attendant on the complaint, to a dilatation of the anterior and posterior branches of the circulus arteriosus. Dr. Baillie has noticed, in his *Morbid Anatomy*, the frequently diseased state of the trunk, or the small branches of the carotid arteries at the side of the sella turcica, and he says the same sort of diseased structure is also found in the basilar artery and its branches.

[From an idea that the pressure of an inordinate secretion of the humours of the eye might occasion a paralysis of the retina, Dr. Physick has punctured the cornea, and evacuated the aqueous humour, in some cases of gutta serena, and with temporary advantage.—Mr. Ware has punctured the sclerotica in certain cases of amaurosis. (See "*Gutta Serena.*") Blisters applied to the eyelids, have also been found beneficial.]

The most valuable information, concerning amaurosis, is to be met with in *Vermischte Chirurgische Schriften von J. L. Schmucker*, Band 2. Berlin Edit. 2. 1786. *Remarks on Ophthalmy, &c* by James Ware. *Inquiry into the causes preventing success in the extraction of the Cataract, &c.* by the same. *Osservazioni sulle Malattie degli Occhi di A. Scarpa*, Venez. 1802. *Hey's Practical Observations in Surgery. Medical Observations and Inquiries*, Vol. 5. *Schmucker's Wahrnehmungen. Richter's Anfangsgründe der Wundarzneikunst. Band 3. Warner's Description of the Human Eye, &c.* *Chandler's Treatise of the Diseases of the Eye*, chap 24. Some scattered remarks in the posthumous work on the diseases of the eye of the late J. C. Saunders, &c.

Some observations connected with the subject of *Amaurosis*, will be found in the articles *Cataract*, *Hemeralopia*, *Hemipopia*, and *Nyctalopia*.

AMBE. (αὐβη, the edge of a rock,
G

from *ἀνέβαινα*, to ascend.) An old surgical machine for reducing dislocations of the shoulder, and so called, because its extremity projects, like the prominence of a rock. Its invention is imputed to Hippocrates. The ambe is the most ancient mechanical contrivance for the above purpose; but, is not at present employed. Indeed, it is scarcely to be met with in the richest cabinets of surgical apparatus. It is composed of a piece of wood, rising vertically from a pedestal, which is fixed. With the vertical piece is articulated after the manner of a hinge, an horizontal piece, with a gutter formed in it, in which the luxated limb is laid, and secured with leather strings. The patient places himself on one side of the machine; his arm is extended in the gutter, and secured; the angle, formed by the union of the ascending piece, and by the horizontal branch, is lodged in the armpit, and then the horizontal branch is depressed. In this way extension is made, whilst the vertical part makes counter extension, and its superior part tends to force the head of the humerus into its cavity. But, there is nothing to fix the scapula, and the compression made by the superior portion of the vertical piece of the machine, tends to force the head of the humerus into its cavity, before it is disengaged by the extension. (*Boyer on Diseases of the Bones, Vol. II.*)

AMBLYO'GMOS, or AMBLYO'SMOS, (from *αμβλυσ*, dull.) A dimness of sight.

AMBLYOPIA, (from *αμβλυσ*, dull, and *ὤψ*, the eye.) Hippocrates means by this word, in his *Aph.* 31. Sect. 3. the dimness of sight, to which old people are subject. Paulus, Actuarius, and the best modern writers, seem to think, that amblyopia means the same thing as the incomplete amaurosis. (*Encyclopédie Méthodique; Partie Chirurgicale; Art. Amblyopie.*)

A'MMA, (from *απλω*, to bind.) A truss, or kind of bandage, or machine, for preventing a protrusion of the bowels in cases of hernia.

AMMONIÆ MURIAS, AMMONIA MURIATA, or *Sal Ammoniac*. Its chief use in surgery is as an external discutient application. See *Lotio Ammon. Muriata cum Aceto*.

Mr. Justamond recommends the following application for the cure of milk abscesses: R *Ammonia Muriatæ* ℥j. *Spiritus Roris marini* lbj. Misce. Linen rags are to be wet with the remedy, and kept continually applied to the part affected.

AMPHISMI'LA. (from *αμφι*, on each side, and *σμιλη*, an incision knife.) A double-edged scalpel.

AMPUTATION. (from *amputo*, to cut off.) This term signifies the operation of cutting off a limb, or other part of the body, as the breast, penis, &c.

Such an operation frequently becomes indispensably proper, on the principle of sacrificing a branch, as it were, for the sake of taking the only rational chance of saving the trunk itself.

The amputation of the large limbs, was anciently practised under many disadvantages. The ignorance of the old surgeons, in regard to the method of stopping hemorrhage, made many patients die, who had courage to submit to the operation. These practitioners were unacquainted with the mode of healing the wound by the first intention; and their instruments were as awkward and clumsy, as their dressings were irritating and improper.

The best modern practitioners have materially simplified all operations. This object has been greatly promoted, by diminishing the number, and improving the construction of instruments, and by abandoning the use of a multitude of external applications, most of which were useless, or hurtful.

But, much improved as amputation has been, no one can dissemble, that it is an operation at once terrible to bear, dreadful to behold, dangerous in its consequences, and leaves the patient for ever afterwards in a mutilated state. Hence it is the surgeon's duty never to have recourse to so severe a proceeding, without a perfect and well-grounded conviction of the necessity for so doing.

Though we seldom see the operation adroitly executed, its performance is by no means difficult, and the reason of the knife being so badly handled in this part of surgery, may generally be imputed to carelessness, slovenly habits, and fear and confusion on the part of the operator. There are several egregious faults in the method of amputating, which even many hospital surgeons in this metropolis are guilty of; but these we shall find, when we criticise them, are, for the most part, very avoidable, without any particular share of unusual dexterity. The real difficulty is to ascertain with precision the cases which demand the operation; those in which it may be dispensed with, and to know the exact periods at which it should be practised. These are considerations requiring the most profound attention, and the brightest talents. "The most expert operator (as Mr. O'Halloran observes) may not always be the best surgeon. To do justice to the sick and ourselves, we must, in many cases, rather avoid than perform capital

operations. As to amputation itself, that its indiscriminate use, or, indeed, rather abuse, has been of infinitely greater detriment to mankind, than service, must be admitted. We daily hear of *sudden* accidents, that require amputation; and nothing is more common, than to be informed, that the patient died, in two or three hours after the operation. In sea engagements, where a limb is torn and shattered, death very soon follows mutilation; and, after battles, the recoveries bear no proportion to the deaths on this account.

"It was this great propensity to lopping off limbs, that caused a complaint to be exhibited to Louis the 14th, that his surgeons estimated the importance of their service by the number of mutilations only; and they were obliged to defend themselves from this aspersion before a prince, who wisely rated the lives of his subjects too high to suffer characters to be gained at their expence. In fact, it is not enough for a surgeon to know *how* to operate; he must also know *when* to do it." (See *O'Halloran's Treatise on Gangrene and Sphacelus: preface.*)

For such reasons, we shall first take a view of the circumstances, under which, the best modern surgeons deem amputation necessary. However, it may be proper to observe, that, in each of the articles, relative to the particular diseases and injuries, which ever render amputation indispensable, additional information will be offered.

1. *Compound Fractures.*

In a compound fracture the necessity for amputation is not always proportioned to the seriousness of the accident, but, also, frequently depends on other circumstances. For example, in the field and on board of ship, it is not always in the surgeon's power to pay such assiduous attention as the cases demand, nor to procure for the patient the proper degree of rest and stillness. In the field there is frequently a necessity for transporting the wounded from one place to another. In these circumstances it is proper to have immediate recourse to amputation, in all recent cases of bad compound fractures, the appearances of which are such as necessarily excite apprehension of the consequences. Doubtless, there are many cases, in which it would not be proper to adopt this practice, even under the most unfavourable circumstances of the above description. So, when a compound fracture occurs, in which the soft parts have not been considerably injured; in which the bones have been broken in such a direction that they can be easily set, and kept in their proper position, and in

which there is only one bone broken, amputation would be unnecessary and cruel. But, when the limb has been considerably injured, and the bones have been so broken that they cannot be kept in a proper position, after being reduced, we may make it a general rule to amputate, under the circumstances above alluded to.

The bad air in hospitals and large cities, which is always so detrimental to wounds, is another consideration which may render amputation advisable.

But, if in camps, on board of ship, in large cities, and hospitals, it is prudent for the surgeon to conform to the above rule, it is not so in other situations. When the patient can be put in a commodious place, whence it will not be necessary to remove him; when he can be left perfectly quiet, with good air and the aid of skilful surgeons; there are not many cases in which patients enjoying all these advantages, must of necessity submit to amputation. However, if the bones, muscles, and other soft parts, should be so bruised and mangled, that there is no hope of the limb ever being able to perform its functions again, we should not hesitate about performing amputation. An injury, which would, by its inevitable consequences, put the patient's life into the most imminent peril, may often be converted by amputation into one of the most simple nature, and easy of cure. (*Encyclopédie Méthodique, Partie Chirurgicale, Art. Amputation.*)

In compound fractures there are three points of time in which amputation may become proper. The first of these is immediately, or as soon as may be after the receipt of the injury. The second is, when the bones continue for a great length of time without any disposition to unite, and the discharge from the wound has been so long, and is so large, that the patient's strength fails, and general symptoms foreboding dissolution come on. The third is, when a mortification has taken such complete possession of the soft parts of the inferior portion of the limb, quite down to the bone, that upon the separation of such parts, the bone or bones shall be left bare in the interspace.

The first and second of these are matters of very serious consideration. The third hardly requires any.

When a compound fracture is caused by the passage of a very heavy body over a limb; such, for instance, as the broad wheel of a wagon, or loaded cart, or by the fall of a very ponderous body on it, or by a cannon shot, or by any other means so violent as to break the bones into many fragments, and so to tear, bruise, and wound, the soft parts, that there

shall be good reason to fear, that there will not be vessels sufficient to carry on the circulation with the parts below the fracture, it becomes a matter of the most serious consideration, whether an attempt to save such a limb, will not occasion loss of life. This consideration must be before any degree of inflammation has seized the part, and, therefore, must be immediately after the accident. When inflammation, irritation, and tension have taken place, and when a disposition to gangrene in the limb, has begun to exert its pernicious influence, it is too late; an operation, then, instead of being beneficial, would prove destructive.

The necessity of immediate or very early decision, in this case, makes this a very delicate part of practice; for, however pressing the case may be to the surgeon, it will not, in general appear in the same light to the patient, to the relations, or to bye-standers. They will be inclined to regard the proposition as arising from ignorance, or an inclination to save trouble, or a desire to operate; and it will often require more firmness on the part of the practitioner, and more resignation and confidence on the part of the patient, than is generally met with, to submit to such a severe operation, in such a seeming hurry, and upon so little apparent deliberation; and yet it often happens, that the suffering this point of time to pass, decides the patient's fate.

This necessity of early decision arises from the quick tendency to mortification, which ensues in the injured limb, and too often ends in the patient's death. That this is no exaggeration, melancholy and frequent experience evinces, even in those whose constitutions previous to the accident, were in good order; but much more in those, who have been heated by violent exercise, or labour, or liquor, or who have led very debauched and intemperate lives, or who have habits naturally inflammable and irritable. This is often the case when the fracture happens to the middle part of the bones, but is much more likely to happen, when any of the large joints are concerned. In many of these cases, a determination for or against amputation, is really a determination for or against the patient's existence.

That it would have been impossible to have saved some limbs, which have been cut off, no man will pretend to say; but, this does not render the practice injudicious. Do not the majority of those who get into the above hazardous condition, and on whom amputation is not performed, perish, in consequence of their wounds? Have not many lives been preserved by amputation, which, from the same circum-

stances, would otherwise most probably have been lost?

Pressing and urgent as the state of a compound fracture may be, at this first point of time, still it will be a matter of choice, whether the limb shall be removed or not; but, at the second period, the operation must be submitted to, or the patient must die.

The most unpromising appearances at first, do not necessarily, or constantly end unfortunately. Sometimes, after the most threatening first symptoms, after considerable length of time, great discharges of matter, and large exfoliations of bone, success shall ultimately be obtained, and the patient shall recover his health and the use of his limb.

But sometimes, after the most judicious treatment through every stage of the disease; after the united efforts of physic and surgery, the sore, instead of granulating kindly, and contracting daily to a smaller size, shall remain as large as at first, with a tawny, spongy surface, discharging a large quantity of thin sanies, instead of a small one of good matter; the fractured ends of the bones, instead of tending to exfoliate, or to unite, will remain as perfectly loose and disunited as at first, while the patient shall lose his sleep, his appetite, and his strength; a hectic fever, with a quick, small, hard pulse, profuse sweats, and colliquative purging, contributing at the same time to bring him to the brink of the grave, notwithstanding every kind of assistance, in these circumstances, if amputation be not performed, what else can rescue the patient from destruction?

The third and last period is a matter which does not require much consideration. Too often the inflammation consequent upon the injury, instead of producing abscess and suppuration, tends to gangrene and mortification, the progress of which is often so rapid, as to destroy the patient in a very short space of time, constituting that very sort of case, in which amputation should have been immediately performed. But, sometimes even this dreadful malady is, by the help of art, put a stop to, but not until it has totally destroyed all the surrounding muscles, tendons, and membranes, quite down to the bone, which, upon the separation of the mortified parts, is left quite bare, and all circulation between the parts above and those below, is by this totally cut off. In this instance, whether the surgeon saw through the bare bone, or leave the separation to be effected by nature, the patient must lose his limb. (*See Pott on Amputation.*)

There is yet another circumstance which may render amputation necessary, in cases

of compound fractures, and this is, when such copious hemorrhages occur, as cannot be stopped by any other means. These bleedings proceed from arteries which have been lacerated by the ends of the broken bone, or some other cause, at the moment of the accident. (*Encyclopédie Méthodique; Partie Chirurgicale, Tom. 1, p. 80.*)

2. *Extensive contused and lacerated Wounds.*

These form the second class of general cases requiring amputation. Wounds without fracture, are not often so bad as to require this operation. When a limb, however, has been contused and lacerated, in such a degree, that all its principal blood vessels are injured, and there is no hope of a continuance of the circulation, the immediate removal of the member should be recommended, whether the bones be injured or not. Also, since no effort on the part of the surgeon can preserve a limb so injured, and such wounds are more likely to mortify than any others, the sooner the operation is undertaken the better.

In these cases, as in those of compound fractures, though amputation may not be necessary at first, it may become so afterwards. The foregoing observations, relative to the second period of compound fractures, are equally applicable to wounds, unattended with injury of the bones. Sometimes hemorrhages occur, which we cannot restrain; or a rapid mortification comes on; or such a copious suppuration, as the system cannot bear any longer. (*Encyclopédie Méthodique; Partie Chirurgicale, Tom. 1, p. 80, 81.*)

3. *Cases in which Part of a Limb has been carried away by a Cannon Ball.*

When Part of a limb has been torn off by a cannon ball, or any other cause capable of producing a similar effect, the end of the stump from which the part has been separated, should be removed with a cutting instrument.

This is an instance in which many surgeons dispute the necessity of amputation. They urge as a reason, that the limb being already removed, it is better to endeavour to cure the wound as speedily as possible, than to increase the patient's sufferings and danger, by making him submit to amputation. It must be remembered, however, that the bones are generally shattered, and reduced into numerous fragments; the muscles and tendons are unequally divided, and their ends torn and contused. All allow it is absolutely necessary to extract the splinters of bone, and cut away the irregular extremities of the tendons and muscles, which operations would require a longer time than amputation itself. Besides, we should recollect, that by making the incision above the injured part, so as to be enabled to cover the bone with flesh and integuments, perfectly free from

injury, the extent of the wound is so diminished, that the healing can be accomplished in one third of the time which would otherwise be requisite. A much firmer cicatrix is also thus obtained. Such reflections must convince us, that amputation here holds forth very great advantages. It cannot increase the patient's danger, and, as for the momentary augmentation of pain, which he suffers, he is amply compensated by all the benefits resulting from the operation. (*Encyclopédie Méthodique; Partie Chirurgicale, Tom. 1, p. 81.*) See *Gun-shot Wounds.*

4. *Mortification.*

Mortification is another cause, which, when advanced to a certain degree, renders amputation indispensably proper. We have noticed, that bad compound fractures, and wounds, often terminate in the death of the injured limb. Such surgeons as, at all events, have been determined to oppose the performance of amputation, have pretended that this operation is totally useless in the present instance. They assert, that when the mortification is only in a slight degree, it may be cured, and that when it has advanced to a considerable extent, the patient will perish, whether amputation be performed or not. But this way of viewing things is so contrary to facts, and the experience of every impartial practitioner, that we shall make no attempt to refute the assertions. Though we allow that it would be very bad practice, every time the slightest appearance of gangrene occurred; yet, when the mischief has increased in such a degree, that all, or the greater portion of the soft parts are gangrenous, as is too frequently the case, there exists no remedy for this state; or, at least, none with which we are acquainted, and amputation is absolutely necessary.

Practitioners have entertained very opposite opinions, concerning the period when one should operate in cases of mortification. Some pretend, that whenever the disorder presents itself, and especially when it is the effect of external violence, we should amputate immediately the mortification has decidedly begun to form, and while the mischief is in a spreading state. Others believe, that the operation should never be undertaken, before the progress of the disorder has stopped, even not till the dead parts have begun to separate from the living ones.

The advocates for the speedy performance of amputation, declare that the further progress of the mortification may be stopped, and the life of the patient preserved, by cutting above the parts affected. Experience, however, has shewn such practice to be highly dangerous, and not deserving of confidence. Whatever pains may be taken in the operation, only to

divide sound parts, there is no certainty of succeeding in this object, and the most skilful practitioner may be deceived. The skin may appear to be perfectly sound and free from inflammation, while the muscles which it covers, and the parts immediately surrounding the bone, may actually be in a gangrenous state. But, even when the soft parts are found free from apparent distemper, on making the incision, still, if the operator should not have waited till the mortification has ceased to spread, the stump will almost always be attacked by gangrene. Surgeons, who have had opportunities of frequently seeing wounds which have a tendency to mortify, entertain the latter opinion. Such was the sentiment of Pott, who says, that he has often seen the experiment made, of amputating a limb in which gangrene had begun to shew itself, but never saw it succeed, and it invariably hastened the patient's death.

The operation may be postponed, however, too long. Mr. Samuel Sharp, in particular, recommended too much delay, advising the operation never to be done till the natural separation of the mortified parts had considerably advanced. Mr. Sharp was a surgeon of immense experience, and his authority carries with it the greatest weight. But, perhaps, he was too zealous in his opposition to a practice, the peril of which he had so often beheld. When the mortification has ceased spreading, there is no occasion for further delay. We now obtain, just as certainly, all the benefits of the operation, and get rid of a mass of putridity, the presence of which may become highly pernici-ous, should the absorbents take up any of the matter into the circulation. However, this danger would not be so considerable as that which would arise from too precipitate an operation; and it is better to defer amputation a little more than is absolutely requisite, than to run any risk of doing it, before being certain that the parts have lost their tendency to gangrene.

Whatever may be the particular cause of the mortification, it makes no alteration in the above doctrines: the practice should always be the same. Though it has been thought that a distinction should be made, between cases in which mortification is the effect of an internal cause, and those in which it is the consequence of an external one; yet, no practical advantage can be deduced from this discrimination. In no cases ought the operation to be performed before the period above specified, and in all it may be undertaken, as soon as there is a positive cessation in the progress of the disorder. (*Encyclopédie Méthodique; Partie Chirurgicale, p. 81, 82.*) See *Mortification*.

5. *White-Swellings.*

Scrofulous joints, with diseased bones, and distempered ligaments, is another case, in which amputation may become absolutely necessary. There is one circumstance attending this complaint which often renders it particularly unpleasant, which is, that the subjects are most frequently young children so as to be incapable of determining for themselves, which inflicts a very distressing task on their nearest relations. All the efforts of physic and surgery often prove absolutely ineffectual, not only to cure, but even to retard this most terrible malady. Notwithstanding many cases admit of cure, there are numerous others which do not so. The disease often begins in the very inmost recesses of the cellular texture of the heads of the bones, forming the large articulations, such as the hip, knee, ankle, and elbow; the bones become diseased in a manner, which we shall explain in the article (*Articulation*), sometimes with great pain and symptomatic fever; sometimes with very little of either, at least in the beginning. The cartilages covering the ends of these bones, and designed for the mobility of the joints, are totally destroyed; the epiphyses in young subjects are either partially, or totally, separated from the said bones; the ligaments of the joints are so thickened, and spoiled by the distemper, as to lose all natural appearance, and become quite unfit for all the purposes for which they were intended: the parts appointed for the secretion of the synovia, become distempered in like manner; all these together furnish a large quantity of stinking sanious matter, which is discharged either through artificial openings, made for the purpose, or through small ulcerated ones. These openings commonly lead to bones which are diseased through their whole texture. When the disease has got into this state, the constant pain, irritation, and discharge, bring on hectic symptoms of the most destructive kind, such as total loss of appetite, rest, and strength, profuse night sweats, and as profuse purgings, which foil all the efforts of medicine, and bring the patient to the brink of destruction.

It is an incontestible truth, that unless amputation be performed, a patient thus situated must perish; and it is equally true, that numbers, in the same circumstances, have, by submitting to the operation, recovered vigorous health. (See *Pott on Amputation*.)

It is a fact highly important to be known, that, in these cases, amputation is attended with more success, when performed late, than when undertaken at an early period, before the disease has made great advances. This is particularly fortunate, as it affords

time for employing such remedies as are at all likely to check the progress of the disorder. (*Encyclopédie Méthodique*, Tom. 1, p. 83.) See *Joints—White-swelling*.

6. *Exostoses*.

We shall here content ourselves with merely mentioning, that this disease may render amputation necessary, when it is impracticable to remove the bony swelling in the manner we shall explain in the article *Exostosis*, and the tumour becomes hurtful to the health, or insupportable, on account of its weight, or other circumstances.

7. *Caries and Necrosis*.

Another distemper, productive of the necessity of amputation, is a caries of a whole bone or bones, forming a limb. A caries is here meant, not merely possessing the surface of such bones, but the whole internal substance, and that from end to end. Bones become carious from a variety of causes, such as struma, lues venerea, deep-seated abscesses, pressure, &c.; and such carious bones, properly treated, often exfoliate and cast off their dead parts. But, when the whole substance of the bone becomes diseased, from end to end, no means will avail. The use of the scalper, the raspator, and the rugine, for the removal of the diseased surface of bones; of the trephine, for perforating into the internal texture of carious bones, and of exfoliating applications, will not succeed, and, unless the whole bone be removed by amputation, the patient will die. Mr. Pott's refutation of Mr. Bilguer, who asserts that amputation is not requisite in these instances, is a masterly and most convincing production.

Admitting, that internal and external remedies may so alter and correct even the carious part of a bone, as to render it capable of parting with the rest, and becoming sound, yet occasionally there is not time for such experiments, and even in very young subjects, the whole habit is, by the rotten bone so poisoned and spoiled, that the worst kind of hectic fever will ensue, in spite of bark and every other specific, in spite of drying, burning, rasping, and boring, and, in a very short space of time, destroy the patient, unless restored by amputation. (See *Caries and Necrosis*.) (*Pott on Amputation*.)

8. *Cancerous and other inveterate Diseases, such as the Fungus Hematodes*.

Cancerous, inveterate diseases, and ulcers on limbs, sometimes render amputation a matter of necessity. In treating of cancer, we shall remark, that little or no confidence should be placed either in inter-

nal or any kind of topical remedies, and that there is nothing, except the total separation of the part affected, upon which any rational hopes of cure can be built. Cancer is not frequently seen in the extremities. Every man of experience, however, must occasionally have seen, in this situation, if not actually cancer, diseases quite as intractable, and which cannot be cured except by removing the affected part. This may often be accomplished without cutting off the whole limb. But, when the disease has spread beyond certain bounds, amputation, above the part affected, is the only thing to which recourse can be had with any hope of success. Sometimes even amputation itself cannot effect a cure, when the operation has been delayed too long. It has succeeded, however, when the disease had re-appeared, after a cure had been seemingly achieved by the excision of the diseased parts.

Besides cancerous, there are other ulcers, which may render amputation indispensable. Thus, when an extensive ulcer, of any sort whatsoever, is evidently impairing the health; when, instead of yielding to remedies, it becomes larger and more inveterate; when, in short, it puts life in imminent danger; amputation should be advised. For further information refer to *Cancer*, *Fungus Hematodes*, &c.

9. *Various Tumours*.

That there are numerous swellings, which destroy the texture of the limbs, render such members useless, afflict the patient with dreadful sufferings, and bring him into the most debilitated state, no man of observation can fail to have seen. When such tumours can neither be discussed, nor cut out with safety, amputation of the limb is the only resource.

Mr. Pott has particularly described a tumour affecting the leg, for which the operation is sometimes requisite. It has its seat in the middle of the calf of the leg, or rather more towards its upper part, under the gastrocnemius and soleus muscles. It begins by a small, hard, deep-seated swelling, sometimes very painful, sometimes but little so, and only hindering the patient's exercises. It does not alter the natural colour of the skin, at least until it has attained a considerable size. It enlarges gradually, does not soften as it enlarges, but continues through the greatest part of it incompressibly hard, and when it is got to a large size, it seems to contain a fluid, which may be felt towards the bottom, or resting, as it were, on the back part of the bones. If an opening be made for the discharge of this fluid, it must be made very deep,

and through a strangely distempered mass. This fluid is generally small in quantity, and consists of a sanies mixed with grumous blood: the discharge of it produces very little diminution of the tumour, and very high symptoms of irritation and inflammation come on, and advancing with great rapidity, and most exquisite pain, very soon destroy the patient, either by the fever, which is high, and unremitting, or by a mortification of the whole leg. If amputation has not been performed, and the patient dies, after the tumour has been freely opened, the mortified and putrid state of the parts, prevents all satisfactory examination; but, if the limb was removed, without any previous operation, and (which Mr. Pott, in his experience, found to be the only way of preserving the patient's life) the posterior tibial artery, will be found to be enlarged, distempered, and burst; the muscles of the calf to have been converted into a strangely morbid mass; and the posterior part of both the tibia and fibula more or less carious. (*Pott on Amputation.*)

It seems only necessary to adduce another species of tumour to illustrate the necessity of amputation. The following case is related by Mr. Abernethy. A woman was admitted into St. Bartholomew's Hospital with a hard tumour in the ham. It was about four inches in length, and three in breadth. She had also a tumour in front of the thigh, a little above the patella, of lesser size and hardness. The tumour in the ham, by its pressure on the nerves and vessels, had greatly benumbed the sensibility, and obstructed the circulation of the leg, so that the limb was very oedematous. As it appeared impossible to remove this tumour, and as its origin and connexions were unknown, amputation was resolved on. On examining the amputated limb, the tumour in the ham, could only be divided with a saw. Several slices were taken out of it by this means, and appeared to consist of a coagulable and vascular substance, in the interstices of which a great deal of bony matter was deposited. The remainder of the tumour was macerated, and dried, and it appeared to be formed of an irregular and compact deposition of the earth of bone. The tumour on the front of the thigh, was of the same nature as that of the ham, but containing so little lime, that it could be cut with a knife. The thigh bone was not at all diseased, which is mentioned, because when bony matter is deposited in a limb, it generally arises from the disease of a bone. (*Surgical Observations*, 1804.)

Before the late facts and improvements, relative to the treatment of aneurisms,

these cases, on the extremities, were generally set down as requiring amputation. Even Mr. Pott wrote in recommendation of such practice, and his observations on this subject are among the few parts of his writings, which the enlargement of surgical knowledge, since his time, has rendered objectionable.

We shall conclude these remarks on the causes requiring amputation, with advising surgeons never to undertake this serious operation, without consulting the opinions of other professional men, when their advice can be obtained.

General Remarks on Amputation.

Although, from the earliest period of human existence, there must have been occasion for performing this operation, we have no decisive proofs from history, that it was ever done by the father of medicine, Hippocrates. A. C. Celsus, who lived in the reign of Tiberius, and whose book, *de Re Medica*, should be read by every surgeon, has left us a short description of the mode of amputating gangrenous limbs. It has been often remarked, that Celsus has left no instructions for securing the divided blood-vessels; but, it has not been commonly noticed, that, in his chapter on wounds, he directs us to stop hemorrhages by taking hold of the vessels, then tying them in two places, and dividing the intermediate portion. If this measure cannot be adopted, he advises the use of a cauterizing iron. Several hints are to be met with in the writings of Celsus, from which it may be inferred, that the ligature of bleeding vessels was sometimes practised in that early age; and this supposition is strengthened, by a fragment of Archigenes, preserved by Cochiuss, on the subject of amputation, where he speaks of tying or sewing the blood-vessels. We are not, however, in possession of all the writings of medical authors, prior to the time of Galen, and must therefore remain in doubt upon this point. (*Rees' Cyclopædia*, Art. *Amputation*.)

The author of the article, referred to, therefore, argues with some appearance of reason, that if amputation often proved fatal in the days of Celsus, "scæpe in ipso opere," as the expression is, it was owing to the want of some efficacious method of compressing the blood-vessels, during the operation itself; for, although the ligature might, perhaps, be employed, they knew not the use of the tourniquet.

But, admitting, that the ancients were not altogether ignorant of the plan of tying arteries, it cannot be credited, that they adopted the practice to any extent, for if

they had, they would not have continued so partial to the cautery, boiling oils, and a farrago of astringent applications. Ambrose Paré, therefore, seems to me to deserve as much praise for the introduction of the ligature into common use, as if no allusions to this method whatever had existed in the writings of Celsus and other ancients.

Before the invention of the tourniquet, the operation was attended with so much danger, that very few surgeons ventured to undertake it, and even since the above instrument became known, a long time elapsed before one half of the patients were saved, on whom amputation had been executed. At present, perhaps, not more than one individual out of twenty loses his life after the operation, even taking into the account all those on whom it is practised in hospitals. In private practice, where one can pay greater attention to various important circumstances, which relate to amputation, the proportion of deaths must be still less.

The different parts of the operation, which deserve particular attention, are, the choice of the place where to amputate; the measures for guarding against bleeding during the operation; the division of the integuments, muscles, and bones, which is to be accomplished in such a manner, as to be able afterwards to cover the whole surface of the stump with skin; tying the arteries, which should be done without including the nerves, or any other adjacent part; placing the integuments in a proper position after the operation; and finally, the subsequent treatment of the wound.

The ancients contented themselves, before making the incision, to have the skin forcibly drawn upward by an assistant; they next divided, by one sweep of the knife, the integuments and flesh down to the bone, and, afterwards, sawed the bone on a level with the soft parts, which were drawn upward. It appears, however, that the views of Celsus extended further than those of most of his cotemporaries, and followers, even almost down to modern times. After cutting the muscles down to the bone, he says, that the flesh should be reflected, and detached underneath with a scalpel, in order to denude a portion of the bone, which is then to be sawn as near as possible to the healthy flesh, which remains adherent. He states that, when this plan is pursued, the skin around the wound will be so loose, that it can almost be made to cover the extremity of the bone. It is to be lamented, that this advice, inculcated by Celsus, should not have been comprehended, or that it should have been so neglected, as to stand in need, as

it were, of a new discoverer, and that a suggestion of such importance should have remained so long useless. But, the fact is, hemorrhage formerly rendered amputation so dangerous, that the ancient surgeons could not devote much attention to any thing else in the operation, and practitioners amputated so seldom, that we read in Albucasis, that he positively refused to cut off a person's hand, lest a fatal hemorrhage should ensue, and the patient did it himself and recovered.

Ambrose Paré, a French surgeon, who flourished in the 16th century, and to whom we have already alluded, made some important innovations, with regard to the operation of amputation. It is to his industry, good sense and skill, that we are chiefly indebted for the abolition of cauterising instruments, and the general use of a needle and ligature to suppress the bleeding, after the removal of a limb.

An anonymous writer has given the following account of the practice and opinions of this distinguished surgeon, in relation to amputation. "Paré recommended to cut off the whole of the gangrenous part, if the limb be mortified; but, to encroach as little as possible upon the living flesh. At the same time, he laid it down as a rule, not to leave a very long stump to an amputated leg; because the patient could more conveniently make use of a wooden leg, with the stump only five finger breadths long, below the knee, than if much more of the flesh were to be preserved. In the arm, however, he left the whole of the living and healthy portion of the member, only separating the diseased part from the sound.

"In preparing for amputation, he directs the skin and muscles to be drawn upwards, and bound tight with a broad bandage, a little above the part, where the incision is to be made. This fillet was intended to answer a threefold purpose: 1st, to afford a quantity of flesh for covering the bone, and facilitating the cure. 2dly, To close the extremities of the divided blood-vessels. 3dly, To dull the patient's feelings, by pressure on the subjacent nerves. When this firm ligature has been applied, Paré directs an incision to be made down to the bone, either with a common large scalpel, or a curved knife. Then, with a smaller curved knife, we are carefully to divide the muscle, or ligament, remaining between the bones of the fore-arm, or leg; after which, we may proceed to saw off the bone as high as possible, and to remove the asperities, occasioned by the saw.

"With the assistance of a curved pair of forceps, he drew out the extremities of the bleeding arteries, either by themselves

alone, or with some portion of the surrounding flesh, to be firmly tied with a strong double thread. He now loosened his bandage, brought together the lips of the wound over the face of the stump, and kept them as close as he could, without actual stretching, by means of four stitches, or sutures. If the larger tied vessels should accidentally become loose, he desires the ligature, or bandage, to be again passed round the limb; or, else, what is better, to let an assistant gripe the limb firm with both hands, and press with his fingers over the course of the bleeding vessel, so as to stop the hemorrhage; then, with a square edged needle, about four inches long, and a thread, four times doubled, the surgeon must secure the artery in the following manner. Thrust the armed needle into the outside of the flesh, half a finger's breadth from the vessel, which bleeds, and bring it out at the same distance from the bleeding orifice; then surround the vessel with the ligature, pass it back again to within one finger's breadth of the place, where it first entered, and tie a fast knot upon a folded slip of linen rag, to prevent its hurting the flesh. By this means, says Parè, the orifice of the artery will be agglutinated to the adjoining flesh so firmly, as not to yield one drop of blood: but, if the hemorrhage were not considerable; he contented himself with the application of astringent powders, &c.

"Thus did this famous surgeon endeavour, by his single example and precepts, to exclude the barbarous use of hot irons in amputation. He says, he knew not of any such practice among the old surgeons; except that Galen recommended us to tie bleeding vessels, towards their origin, in accidental wounds; and he thought proper to do the same in cases of amputation. But, in an apology, at the end of his book, Parè has quoted, in his own defence, a dozen authors, who employed, or recommended the ligature before him; and he might have cited many more.

"From the statement, we have here given, it may be seen, how far our best writers, of every country almost have erred in ascribing the original invention of tying arteries to Ambrose Parè. Great merit, indeed, was due to him, for the part he took in extending, and even reviving this incomparable practice; nay, it is not certain, whether any one before him had ever applied the needle and ligature in similar cases, i. e. after amputation: but, how very wide of the truth, Mr. John Bell's recent account of this matter is, will appear to every person, who will enquire into the facts themselves; for,

not only were ligatures and needles in use, among the ancients; but, likewise the tenaculum, or hook to lay hold of the bleeding vessels, when they had buried themselves in the muscles. We refer our inquisitive readers to Avicenna, Ætius, Albucasis, Brunus, Theodoric, Guido di Cauliaco, John de Vigo, Bertapalia, Tagaultins, Petrus Argillata, Andreas a Cruce, &c. &c. where they will find enough to satisfy them on this head." (*Rees' Cyclopædia art. Amputation.*) See also the article *Hemorrhage*, in this Dictionary.

As Parè, however, like the rest of the old surgeons, used to cut directly down to the bone, many of the stumps, which he made, must have been badly covered with flesh, and ill fitted for bearing pressure. But, all that I have read on the subject of amputation impresses me with a strong conviction, that, in former times, the projection of the end of the bone, the sugar loaf form of the stump, the frequent exfoliations, and the difficulty in healing the part, and keeping it healed, were more owing to the rude way of dressing the stump, and ignorance how the right method of promoting union by the first intention, than the method of operating, or any other circumstance.

Cheselden is regarded as the surgeon, who revived Celsus' method, in proposing to divide the soft parts by a *double incision*, that is by cutting the skin and cellular substances first, and then, by dividing the muscles, down to the bone, on a level with the edge of the skin. In this manner the bone could be sawn higher up, and its end could be more completely covered with skin. The wound, however, always continued very large, so that after the amputation of the thigh, three, four, and often five or six months, elapsed before the stump was healed. After all, this had a disadvantageous form, being commonly pyramidal, by reason of the projection of the bone beyond the soft parts. A new ulcer was also frequently produced, by an exfoliation of this part of the bone, long after the patient has been deemed quite cured.

To hinder the stump from assuming this pyramidal, or sugar-loaf shape, a circular bandage was employed, which acted by supporting the skin and muscles, and preventing their retraction. The bandage, when properly applied, from the upper part of the limb downward, fulfilled in a certain measure the end proposed, but, never answered well enough to make the wound heal in a reasonable time. Mr. Sharp proposed bringing the edges of the skin together with sutures; but, the pain and other inconveniencies of this method

were such, that it was never extensively adopted, and Mr. Sharp himself ultimately abandoned it. It is to be regretted, that a very excellent modern surgeon, Mr. Hey, should have spoken rather in favour of the use of sutures, in bringing together the edges of the wound after amputation. (*Practical Observations in Surgery*, p. 534, Edit. 2.)

It appears, from the above account, that our ancestors failed in their endeavours to amputate, so as to shorten the time required for healing the wound, and give the stump a flat, smooth surface. Hence, several surgeons, about forty years ago, endeavoured to revive the method of amputating with a flap, which was practised above a century ago by Lowdham, an Englishman, and was afterwards brought into notice again, at different periods by M. M. Verduin, Sabourin, Vermale, and La Faye. The plan consisted in preserving a large portion of the muscles and integuments, below the place, where the division of the bone was made, in order to put this flap over the stump, and retain it in this position by a suitable mode of dressing, until an union was accomplished. The operation will be explained hereafter.

The most zealous hopes were always placed in this method, which, to the advantage of defending the end of the stump by a sort of thick fleshy cushion, added that of covering it with perfectly sound skin. But, notwithstanding the exertion of many able men to bring the flap operation to perfection, it has always sunk into disuse. Some surgeons of the present day, however, have not been deterred from further trials to improve the method, while others have endeavoured to perfect the method of amputating with a circular incision. The labours of both the former and latter have not been useless, and, in both ways, by covering the stump with sound skin, the part has often been healed by the first intention, except just where the ligatures of the vessels were situated.

MR. ALANSON'S MODE OF AMPUTATING.

This gentleman begins his *Practical Observations on Amputation*, with exposing, how useless and inconvenient it was to apply a circular band round the limb, with a view of directing the track of the knife, and giving steadiness to the parts, as was commonly done, before his publication issued from the press.

As soon as the tourniquet is applied, let an assistant grasp the limb circularly with both hands, and firmly draw the skin and muscles upward. The operator must then fix his eye upon the proper part, where he is to begin his operation, and he will now make the circular incision through the skin,

and adipose membrane, with considerable facility and dispatch, as the knife will pass much quicker, in consequence of the tense state in which the parts are supported. The operator not being confined to cut in the exact line of the tape, he can also execute this part of the operation, in half the time, which is required in the mode usually practised. The division of the skin being the most painful part of incisions in general, it should always be done as quickly as possible. By drawing up, and supporting the skin and muscles, as here directed, we more fully attain the grand object of preserving as much skin and muscular substance, as will afterwards form a good cushion upon the extremity of the bone.

After the incision, through the integuments, let the assistant still continue a steady support of the parts, then separate the cellular and ligamentous attachments with the point of your knife, till as much skin is drawn up, as will with the united assistance of the particular division of the muscles hereafter recommended, fully cover the whole surface of the wound.

Although a speedy cure may be produced, by covering the wound with skin and adipose membrane only, yet the after consequences are of very material importance in the thigh amputation, and hence the following mode deserves attention, as the parts thus divided, form a thicker cushion over the bone, are much better adapted to immediate contact, union, and the formation of a stump with a regular surface. Hence, after the advised separation of the cellular and ligamentous attachments to the necessary extent, instead of applying the knife close to the edge of the integuments, and dividing the muscles in a circular perpendicular manner down to the bone, proceed as follows. We will suppose you are operating upon the thigh, and standing on the outside of the limb. Apply the edge of your knife, under the edge of the supported integuments, upon the inner edge of the vastus internus muscle, and cut obliquely through that and the adjacent muscles, upwards as to the limb, and down to the bone, so as to lay it bare, about three or four finger's breadth higher, than is usually done, by the common perpendicular circular incision. Now draw the knife towards you, then its point rests upon the bone, and keeping the edge in the same oblique line, already pointed out by the former incision, the rest of the muscles are to be divided in that direction all round the limb, the point of the knife being in contact with, and revolving round the bone through the whole of the division.

The speedy execution of the above directed incision, will be much expedited, by one assistant continuing a firm and

steady elevation of the parts, and another attending to preserve the skin from being wounded, as the knife goes through the muscles, at the under part of the limb. Many practitioners next proceed to deprive the bone of its periosteum to a considerable extent, above and below the part, where the saw is to pass, and this they do so minutely, as to consume a considerable time in its execution. This step not only creates unnecessary delay, but, as the periosteum serves to support the vessels in their passage to the bone, is also apt to produce exfoliations, above the part where the bone is to be divided with the saw. Instead of this practice, first apply the retractor, as advised by Gooch and Bromfield, then denude the bone at the part, where you intend the saw to pass, and you will now saw it off higher than is usually practised, which is a material object in preventing a projection of the bone, and forming a small cicatrix.

A stump, formed in the thigh, agreeably to the foregoing plan, (if you bring the parts gently forward after the operation, and then view the surface of the wound,) may be said to resemble, in some degree, a conical cavity, the apex of which is the extremity of the bone: and the parts thus divided, are obviously the best calculated to prevent a sugar-loaf stump.

The part, where the bone is to be laid bare, whether two, three, or four fingers breadth higher than the edge of the retracted integuments; or, in other words, the quantity of muscular substance to be taken out, in making the double incision, must be regulated by considering the length of the limb, and the quantity of skin that has been previously saved by dividing the membranous attachments. The quantity of skin saved, and muscular substance taken out, must be in such an exact proportion to each other, as that by a removal of both, the whole surface of the wound will afterwards be easily covered, and the limb not more shortened, than is necessary to obtain this end.

After the removal of the limb, let each bleeding artery be gently drawn out with the tenaculum, and tied with a common slender ligature, as naked as possible. When the large vessels are tied, the tourniquet should immediately be slackened, and the wound well cleaned, to detect any vessel, that might otherwise lie concealed with its orifice blocked up by coagulated blood; and before the wound is dressed, its whole surface should be examined with the greatest accuracy, by which Mr. Alanson has frequently observed a pulsation, where no hemorrhage previously appeared, and turned out a small clot of blood from within the orifice of a considerable artery. Particu-

lar attention, is well bestowed in making every vessel secure, that is likely to bleed on the attack of the symptomatic fever; for besides the fatigue and pain, to which such an accident immediately exposes the patient, the desired union of the wound is also considerably interrupted. The whole surface of the wound must always be well cleaned with a sponge and warm water, as any coagulated blood would be a considerable obstruction to a quick union of the parts.

Let the skin and muscles be now gently brought forwards; fix the flannel circular roller round the body, and carry it, two or three times rather tight round the upper part of the thigh, as at this point, it is intended to form a sufficient basis, that materially adds to the support of the skin and muscles. Then carry it forwards in a circular direction, to the extremity of the stump, not so tight as to press rudely or forcibly, but so as to give an easy support to the parts.

You are now to place the skin and muscles over the bone, in such a direction, that the wound shall appear only as a line across the face of the stump, with the angles at each side, from which points, the ligatures are to be left out, as their vicinity to either angle directs. The skin is easily secured in this posture by long slips of linen, or lint, about two fingers in breadth, spread with cerate, or any cooling ointment. If the skin do not easily meet, strips of sticking plaster are best. These are to be applied from below upwards, across the face of the stump, and over them a soft tow pledget and compress of linen; the whole to be retained with the many-tailed bandage, with two tails to come from below upwards to retain the dressings upon the face of the stump.

Mr. Alanson thinks it very injudicious to raise the end of the stump far from the surface of the bed with pillows, as the posterior muscles become drawn upward by so doing. It is best to raise the stump about half a hand's breadth from the surface of the bed, by which the muscles are put in an easy relaxed position. The many-tailed bandage is much more convenient than the woollen cap, frequently used to support the dressings, though this seems well calculated to answer that purpose; but, if not put on with particular care, the skin is liable to be drawn backwards from the face of the stump, nor can the wound be dressed, without first lifting up the stump to remove the cap.

Mr. Hey thinks the place of the incision through the muscles, the height to which the skin must be retracted, and the place, where the bone must be sawn above the first incision, might all be reduced to de-

terminate measures. A few experiments would enable you to determine precisely, in any limb of given circumference, how many inches the skin must be retracted, &c. and these might be measured by an assistant, if he had little bits of straw, or wood, marked for this purpose. The determination of the proper quantity of skin to be saved will be much assisted by reflecting that the diameter of a circle is a trifle more than one third of its circumference; but, to call it one third will be sufficiently exact for our purpose. Hence, if we perform the flap operation, upon a limb, the circumference of which is nine inches, the flap required to cover this wound, must be somewhat more than three inches long; and by the same rule, the quantity of integuments necessary to be preserved to cover a stump of given circumference in any limb, operated upon without the flap, is easily determined.

If the limb be large, the division of the cellular and membranous attachments must be extended in proportion. In emaciated limbs, little more than the oblique turn of the knife to lay bare the bone sufficiently high, will be necessary for the preservation of as much skin, &c. as will cover the wounded surface, and, when practicable, the preference should always be given to the latter mode.

Mr. Alanson used to operate with a double-edged knife, rather smaller, than a common amputation one, than which it is more handy; and being more rounded at the point, than the straight-edged knife, it completes the division of the attachments, and the oblique section of the muscles, more speedily; and, in the whole operation, it has an advantage, that either edge will cut by the slightest turn of the hand. (*See Alanson's Practical Observations on Amputation.*)

AMPUTATION OF THE THIGH, AS PRACTISED BY THE BEST MODERN SURGEONS.

The thigh ought always to be amputated as low as the disease will allow. The patient is to be placed on a firm table, with his back properly supported by pillows, and assistants, who are also to hold his hands, and keep him from moving too much during the operation. The ankle of the sound limb is to be fastened by means of a garter, to the nearest leg of the table.

The next thing is the application of the tourniquet. (For a description of this instrument see *Tourniquet*.) The pad should be placed exactly over the femoral artery, in as high a situation, as can conveniently be done. When the thigh is to be amputated very far up, it is perhaps better to let

an assistant compress the femoral artery in the groin, by any commodious instrument, having a round blunt end, calculated for making direct pressure on the vessel, without injuring the integuments. Were the patient, however, very weak, and unable to bear loss of blood, as there might, in this way, be some bleeding, by reason of the anastomoses with the branches of the internal iliac artery, it would be better to employ the tourniquet, if possible. Whether the right or left thigh is to be removed, it is customary for the operator to stand on the patient's right side. The great advantage of this situation seems to be, that the surgeon's left hand can be thus more conveniently, and quickly brought into use, than if he were always to stand on the same side, as the limb he is about to amputate. This seems to be the only assignable reason for this habit: for, when the left thigh is to be amputated, it is certainly some inconvenience to have the right limb, between the operator, and the one that is to be removed. But, perhaps, this is less inconvenient than not having the left hand next the wound.

An assistant, firmly grasping the thigh with both hands, is to draw upward the skin and muscles, while the surgeon makes a circular incision as quickly as possible through the integuments down to the muscles. When the thigh is bulky, the large amputating knife will be found the best. Before beginning this first cut, the arm is to be carried under the limb, till the knife reaches almost round to the same side on which the operator stands. With one sweep, penetrating to the fascia, the knife is then to be brought round to the point, where it first touched the skin. Thus the wound is more regularly made, than by cutting first on one side, then the other, and the patient is saved some degree of pain, in consequence of the uninterrupted quickness, with which the incision is made.

The cellular substance, connecting the skin, immediately above this wound, with the fascia, is next to be divided all round the limb, till as much skin can be drawn back, as will afterwards conjointly with the muscles, cut in a mode described in the foregoing account of Mr. Alanson's plan, cover the end of the stump with the utmost facility. The detached skin is to be turned up, in order to be out of the way, at the time of cutting the muscles, and sawing the bone. Here it seems useless to repeat the explanation of the division of the muscles, as practised by Mr. Alanson, and still adhered to by the generality of surgeons.

M. Louis, a French surgeon of extraor-

dinary talents, endeavoured to introduce into practice the plan of dividing the loose muscles first, and lastly those, which are closely connected with the bone. This eminent man took notice, that the muscles of the thigh became retracted in an unequal degree, after being divided. Those which are superficial, and extend along the limb, more or less obliquely, without being attached to the bone, were drawn up with greater force, and in a greater degree, than others, which are deeply situated, in some measure, parallel to the axis of the femur, and fixed to this bone throughout their whole length. The retraction begins the very instant, when the muscles are cut, and is not completed till a short time has elapsed. Hence, the effect should be promoted, and be as perfect as possible, before the bone is sawn. M. Louis was always desirous of letting the muscles contract as far as they could in the amputation of the thigh, and, for this reason, he was rather averse to using the tourniquet, as the circular pressure of this instrument counteracted, in some measure, what he wished to take place, and hence he even advised making pressure on the artery by means of an assistant.

Actuated by such principles, M. Louis practised a kind of double incision, different from either Cheselden's, or Alanson's method. By the first wound, he cut, at the same time, both the integuments and the loose superficial muscles; by the second, he divided those muscles, which are deep, and closely adhered to the femur. On the first, deep, circular, cut being completed, M. Louis used to remove a band, which was placed round the limb, above the track of the knife. This was taken off, in order to allow the divided muscles to become retracted without any impediment. He next cut the deep adherent muscles, on a level with the surfaces of those loose ones, which had been divided by the first incision, and which had now attained their utmost state of retraction. In this way, he could evidently saw the bone very high up, and the painful dissection of the skin from the muscles was avoided. M. Louis was conscious, that there was more necessity for saving muscle than skin; he knew, that when an incision is made at once down to the bone, the retraction of the divided muscles always left the edge of the skin projecting a considerable way beyond them. Hence he deemed the plan of first saving a portion of skin, by dissecting it from the muscles, and turning it up, quite unnecessary. The impartial reader, who takes the trouble to read the remarks on amputation, published by this greatest of the French surgeons in

the *Mém. de l'Acad. de Chirurg.* will at once be impressed with the force and perspicuity of the matter, and with the evident propriety of a good deal of the practice inculcated. It gives me pleasure to remark, that many excellent surgeons, whom I have seen operate, do not exactly follow Mr. Alanson's plan of cutting in an oblique manner at once down to the bone, after the integuments have been cut, detached, and reflected; but, so far adopt the principles of M. Louis, as to divide the loose muscles first, immediately after saving the necessary quantity of skin, and, lastly, those, which are intimately attached to the bone throughout their whole extent. This is certainly a better mode of operating, than to follow precisely Mr. Alanson's directions. Candour, however, obliges me to confess, that the attempt to divide the loose muscles first, and then the more fixed ones, is very apt to make an unskilful surgeon cut the whole, or a great part, of the same muscle through more than once; a fault in modern practice, which, as far as my judgment extends, deserves reprobation, as much as any proceeding that can be instanced. To say how unnecessary it is to divide any muscle more than once, is as needless as to remind the reader of its doubling the agony of a very severe operation.

Having cut all the fibres on every side, down to the bone, a piece of linen, somewhat broader than the diameter of the wound, should be torn at one end, along its middle part, to the extent of about eight or ten inches. This is called a retractor, and is applied by placing the exposed part of the bone in the slit, and drawing the ends of the linen upwards on each side of the stump. In this manner, the retractor will obviously keep every part of the surface of the wound out of the way of the saw. I have seen this instrument do so much mischief, in consequence of the operator neglecting to use the retractor, that my conscience obliges me to censure such surgeons as are in the habit of employing the saw, without defending the soft parts by this simple contrivance. Some have rejected the use of the retractor, because they have seen it get under the teeth of the saw, and obstruct the action of the instrument; but, this very circumstance adduced against the retraction, is, when considered, the strongest one that could possibly be brought forward in its favour, as the surface of the wound itself, and particularly the edges of the skin, would, in all probability, suffer the same fate as the linen, by getting under the teeth of the saw, if no retractor were employed, in attempting to saw the bone high up, as closely as possible to the soft parts. I think no one

can urge any but the most frivolous objections to the use of the retractor, and I know that many who have been with myself eye-witnesses of the mischief frequently done by the saw in amputations, are deeply impressed with an aversion to the neglect of this bandage. I have often seen the soft parts adroitly divided, and I have in these same instances, seen the operators, directly afterwards, lose all the praise which every one was ready to bestow, by their actually sawing through one half of the ends of the muscles together with the bone. Men who have had fortitude not to utter a sigh, nor to let a groan be heard, in the previous sufferings, have now had their involuntary cries extorted from them by unnecessary, unjustifiable torture. But, besides defending the surface of the stump from the teeth of the saw, the retractor will undoubtedly enable the operator to saw the bone higher up than he otherwise could do.

Another proceeding, which seems fit for reprobation, and which, indeed, Mr. Alanson very properly condemned, is the practice of scraping up the periosteum with the knife, as far as the muscles will allow. Nothing seems more probable, than that this may be the cause of the exfoliations which occasionally happen after amputations. At all events, it is a superfluous, useless measure, as a sharp saw, such as ought to be employed, will never be impeded by so slender a membrane as the periosteum. All that the operator ought to do, is to take care to cut completely down to the bone, all round its circumference. Thus a circular division of the periosteum will be made, and upon this precise situation the saw should be placed. (*First Lines of the Practice of Surgery, Edit. 3.*)

But, in no part of the operation of amputation do operators in general display more awkwardness, than in sawing the bone, though perhaps not of that pernicious sort as the errors already noticed. At the time of sawing the bone, much depends upon the assistant who holds the limb. If he should elevate the lower portion of the thigh bone too much, the saw becomes so pinched that it cannot be worked. On the other hand, should he allow the weight of the leg to operate too much, the thigh bone will break before it is nearly sawn through, and its ends will be splintered. It is one of the most common remarks of such persons, as are in the habit of frequently seeing amputations, that the part of these operations, which a plain carpenter would do well, foils the skill of a consummate surgeon, and few operators acquit themselves well in using the saw. Many of them begin the action of this instrument, by moving it in a direction con-

trary to the inclination of its teeth. Many, seemingly through confusion, endeavour to shorten this part of the operation, by making short, very rapid, and most convulsive strokes, with the saw. Almost all operators fall into the error of bearing too heavily on the instrument. That operator will saw best, who makes the first stroke of the saw, by applying its heel to the bone, and drawing the instrument across the part, towards himself; this makes a slight groove in the bone, which serves very materially to steady the future operations of the instrument; who makes long, regular sweeps with the saw, rather slowly than quickly, rather lightly than heavily. But, there is often a fault in the construction of the saw itself, which impedes its action, quite independently of any fault on the part of the surgeon himself. I allude to not having the edge of the instrument a little broader than its blade. When the saw is well made, the teeth always make plenty of space for the rest of the instrument to move in.

If the bone should happen to break before the sawing is finished, the sharp pointed, projecting spiculæ thus occasioned, must be removed by means of a strong, cutting sort of forceps, termed *bone nippers*.

After the removal of the limb, the femoral artery is to be immediately taken hold of with a pair of forceps, and tied, taking care to leave the accompanying branches of the anterior crural nerve out of the ligature. None of the surrounding flesh ought to be tied, though the ligature should undoubtedly be placed round the artery, just where this vessel emerges from its lateral connections. Mr. Hey has been accustomed to tie the femoral artery twice, leaving a small space between the ligatures, and this method has been constantly used in the Leed's Infirmary. Some reasons against this plan will be found in the article (*Hæmorrhage*.) The other arteries are usually taken up with a tenaculum. After tying as many vessels as require it, one half of each ligature is to be cut off near the knot on the surface of the stump. One portion is quite sufficient for withdrawing the ligature when this becomes loose, and the other being only an extraneous body, and productive of irritation and suppuration, should never be allowed to remain. Mr. Alanson directs the ends of the ligatures to be left hanging out at the two extremities of the wound, according as their nearness may point out as best. But when a ligature is situated in the centre of the wound, it is best to bring it out between the strips of adhesive plaster, at the nearest part of the surface;

otherwise its running across one half the wound to get at either angle, would create a great deal of unnecessary irritation and suppuration.

Sometimes, the sawn surface of the bone itself bleeds rather profusely. When this happens, it is an excellent plan, which I have often seen Mr. Ramsden and others adopt with the greatest success, to hold a compress of lint over the end of the bone, during the time requisite for securing the rest of the vessels. At the end of this period, the compress may generally be taken away, as the bleeding from the bone will have entirely ceased. As *Monro* remarks, the surgeon ought not to content himself with tying only such vessels, as he observes throwing out blood, while the patient is faint with pain; he should endeavour to rouse him from that faintish state by a cordial, and then wiping off the coagulated blood with a sponge, wet in warm water, he should examine narrowly all the surface of the stump, otherwise he may expect to be obliged by a fresh hemorrhage to undo all the dressings. (*On Amputation of the Larger Extremities, p. 475. Monro's Works.*)

In the account of Mr. Alanson's plan, we have explained how the wound is to be brought together with strips of sticking plaster. Over these, and the ends of the ligatures, it is best to place some pieces of lint, spread with the unguentum spermatis ceti, to keep them from sticking, which becomes an exceedingly troublesome circumstance, when the dressings are to be removed. I am decidedly averse to the general plan of loading the stump with a large mass of plasters, pledgets, compresses, flannels, &c. I see no reason, why the strips of adhesive plaster, and a pledget of simple ointment, should not suffice, when supported by two cross bandages, and a common linen roller, applied in a circular way, round the limb, from above downward. The first turn of the roller, indeed, should be fixed round the pelvis. The two cross bandages, often called the Malta-cross, are to be put over the end of the stump, one in each diameter.

I am completely of opinion with Mr. Alanson, that the elastic woollen cap, commonly placed over all the bandages and dressings, if not put on with a great deal of care, has a tendency to push the skin backward from the extremities of the stump, and as it must also heat the part very much, its employment ought apparently to be discontinued.

If possible, the dressings should never be removed before the fourth day, not reckoning the one on which the amputa-

tion was performed. *Monro* set down the fifth, sixth, or seventh day, as generally soon enough for this purpose. He allows, however, that, if the smell of the wound should become offensive, the outer dressings may be removed sooner. Even when the dressings are to be taken away, it will frequently be found useful not to remove one strip of plaster; but, the stump must be made clean, and any discharge present washed away. (*Monro.*)

At the end of five or six days, the surgeon may begin to try, in a very gentle manner, whether any of the ligatures are loose. However, he should not use the smallest force, nor persist if the trial should create pain. One would hardly try, whether the ligature on the main artery is loose, before the eighth or ninth day.

Though, in the above account, we have directed the edges of the wound, after the amputation of the thigh, to be brought together in such a way, that the wound shall appear as a line across the face of the stump, yet there are instances in which the bone seems most easily and conveniently covered, by making the line of the wound in a perpendicular direction. Mr. Alanson objected to the latter mode, asserting, that the cicatrix afterwards became situated immediately over the end of the bone, the pressure of which was very likely to make the part ulcerate. However, in St. Bartholomew's Hospital, a thigh was, some time since, amputated by Mr. Harvey, and the edges of the stump were brought together in the perpendicular direction, yet, according to all accounts, a better stump could not have been made. In a case, in which I assisted Mr. Ramsden at Christ's Hospital, when an attempt was made to put up the wound in the common manner, the bone seemed to make considerable pressure against the skin, which did not happen, when the line of the wound was made in the other direction, which of course was immediately adopted. Mr. Hey has noticed this subject as follows: the integuments and muscles may be brought into contact by pressing either the anterior and posterior parts, or the sides of the thigh, together. The former method, by the gradual retraction of the posterior muscles, causes the integuments of the anterior part of the stump to cover more completely the extremity of the bone. The latter method causes the integuments and muscles to meet each other the more readily, and, therefore, is to be preferred, when the quantity of soft parts preserved is somewhat deficient. (*Practical Observations on Surgery, p. 533, edit. 2.*)

HEMORRHAGE AFTER AMPUTATION.

Bleeding, after the operation, is of two kinds, in regard to the time, when it occurs. The first takes place within twenty-four hours after the operation. Hence, an assistant should always be left with the patient, with directions carefully and repeatedly to look at the stump, and if any bleeding should arise, to apply the tourniquet, until further aid is obtained. In case no assistant can be spared for this purpose, as must frequently happen in country practice, the tourniquet should always be left slackly round the limb, and the nurse, or patient himself, directed to turn the screw of the instrument, in order to tighten it in case of need. A slack tourniquet left round the limb, after amputation, cannot do harm, and its not having been ready in this way, has cost many patients their lives, as I have known instances of.

This kind of hemorrhage has often been known to arise from the pressure of a tight bandage round the stump. As *Monro* observes, the circular turns of the bandage, when tight, must stop the return of blood in the cutaneous veins, and by making thus a greater resistance to the blood in the arteries, which anastomose with them, occasion the contracting power of the heart and arteries to dilate, and force more blood into their other branches; but, these being cut in the amputation will pour out their blood, and so an hemorrhage is brought on. Making much pressure round a stump is highly deserving of reprobation, and whenever there is an universal oozing of blood, be sure, that the circulation in the superficial veins is not impeded by the tightness of the bandage.

If the bleeding should not be from an artery of consequence, the application of linen, dipped in the cold saturnine lotion, will sometimes check it, and the disagreeable necessity for removing the dressings and opening the wound, may thus be avoided.

But it often happens, that the wound must be opened, and the bleeding vessel tied. This is a very painful proceeding to the patient, and when the dressings have been applied some hours, so that the stump has had time to inflame, nothing can exceed the suffering to which the patient is subjected. Here we see the prudence of being very careful to tie every suspicious vessel in the first instance.

The second sort of hemorrhage, after amputation, arises from ulceration of the large arteries, and may occur a month after the operation, when the ligatures are all away, and the patient seems nearly well.

Two such cases are related by *Mr. Bromfield* (Vol. 1 p 307.) This kind of bleeding is less common than formerly, now the plan of covering the stump with sound skin is adopted. When the bleeding vessel is large, there is no chance of putting the patient out of danger, except by cutting down to the vessel, and tying it. The trunk of the vessel can sometimes be more conveniently tied, than the bleeding branch itself.

Mr. Hey makes mention of a particular sort of hemorrhage, after the operation: "I have seen (says he) a few instances of the integuments becoming so contracted after the operation, as to compress the veins just above the extremity of the stump, and bring on, after some hours, a copious hemorrhage. When it has appeared clear to me, that the hemorrhage was venous, I have made a division of the integuments, on one side of the thigh, sufficient to remove the stricture, and this method has immediately suppressed the hemorrhage." (P. 530, edit. 2.)—I shall make another extract from this interesting author on the present subject.

"When we are under the necessity of amputating a limb, that has suffered great contusion, though the operation is performed upon a part apparently sound, the wound sometimes becomes sloughy and ill conditioned. No good granulations arise to cover the extremities of the arteries; but the ligatures cut through these vessels, or becoming loose, cease to make a sufficient pressure upon them, and hence repeated hemorrhages ensue. This is a dangerous state for a patient; for, if the vessels are taken up afresh with the needle, the hemorrhage will now and then return in the course of two, or three days. In such cases, the application of dry sponge, cut transversely, as directed by *Mr. White* (*Cases in Surgery*), has been found singularly useful, and has saved the life of the patient. But, a constant pressure must be kept upon the pieces of sponge, by the fingers of a succession of assistants, till granulations begin to arise upon the stump, and the prospect of future hemorrhage disappears. This method is of the greatest importance after amputation on the thigh, or leg, where the great vessels are deeply seated. In the arm, above the elbow, where the vessels are more superficial, the great artery may be taken up, with a portion of muscular flesh, above the surface of the stump, by making first an incision through the integuments. My colleague *Mr. Logan*, has done this twice within the last year, with complete success, when repeated ligatures, applied in the usual way, had failed."

"In the morbid sloughy state of the stump, above-mentioned, the application of lint, soaked in a liquid, composed of equal quantities of lemon juice and rectified spirit of wine, has been found very advantageous, and has caused it to put on soon a healthy aspect." (P. 536, 537, *edit. 2.*)

SPASMS OF THE STUMP.

Spasmodic contractions of the muscles of the stump is another very afflicting occurrence. Such spasms put the patient to the greatest agony, and, in some cases, increase so much as to affect the whole body, and even occasion death. But, this unfortunate affection, which was rather frequent after amputations performed in the ancient manner, is infinitely less so, after the modern improved plans of operating, tying the vessels, and dressing the wound. When such spasms, however, do occur, the stump must be kept from starting, by fastening it to the pillow and bedding, on which it lies, and opium, and camphorated medicines, are to be liberally exhibited. (*Encyclopédie Méthodique, Partie Chirurgicale, Tom. 1, p. 93. Latta's Surgery, Vol. III. &c.*)

AMPUTATION BELOW THE KNEE.

In treating of amputation of the thigh, we have remarked, that as much of the limb as possible should be preserved. The longer it is after the operation, the stronger and more useful will it be found. But, when the leg is to be amputated, authors have set it down, as almost an invariable rule, that the operation is to be performed a little way below the knee, even though the disease, for which the limb is removed, may be situated in the foot, or ankle, and would allow the operation to be done much further down. The common practice is to make the incision through the integuments, just low enough to enable the operator to saw the bones, about four inches below the lowest part of the patella. This degree of lowness is necessary, in order not to deprive the stump of that power of motion, which arises from the flexor tendons of the leg continuing undivided. It is alleged also, as a reason for this mode of proceeding, that it is quite sufficient to preserve a few inches of the leg, in order to afford the body a proper surface of support, in walking with a wooden leg; whereas if a larger portion were saved, the superfluous part would be a great inconvenience both in walking, and sitting down, without being of the smallest utility, in any respect whatever.

The tourniquet should be applied to the femoral artery, about two-thirds of the way down the thigh, just before the vessel perforates the tendon of the triceps muscle. This place is much more convenient than the ham. The patient is to be placed upon a firm table, as in the amputation of the thigh, and the leg being properly held by one assistant, while the integuments are drawn upward by another, the surgeon, with one quick stroke of the knife, is to make a circular incision through the integuments all round the limb. Some recommend the operator to stand on the inside of the leg, in order that he may be able to saw both bones at once. No reflections could ever make me perceive, that any real advantage ought strictly to be imputed to this plan. Many suppose this method diminishes the chance of the fibula being splintered, by this bone being completely divided rather before the tibia. But, splintering the bones arises from the assistant depressing the limb too much, or else not supporting it enough. It would be difficult to explain, why the tibia, in this plan, should not be splintered, instead of the fibula, when a certain thickness of it has been sawn through, if the assistant should be guilty of the above mismanagement.

Having made a circular cut through the integuments, the next object is to preserve skin enough to cover the front of the tibia, and the part of the stump, corresponding to the situation of the tibialis anticus, extensor longus pollicis pedis, and other muscles between the tibia and fibula, and those covering the latter bone. Throughout this extent, there are no bulky muscles, which can be made very serviceable in covering the end of the stump, and consequently, the operator must take care to preserve sufficient skin in this situation, by dissecting it from the parts beneath, and turning it up.

On the back part of the leg, on the contrary, the skin should never be detached from the large gastrocnemius muscle, which, with the soleus, will here form a sufficient mass for covering the stump. Hence, as soon as the skin has been separated in front, and on the outside of the leg, the surgeon is to place the edge of the knife in the division of the integuments behind, and cut directly through the muscles of the calf, from the inner edge of the tibia quite across the fibula, supposing the operator to be on the patient's left side. Then the flap formed by the integuments, and muscles of the calf, is to be held back by one of the assistants, while the surgeon completes the division of the rest of the muscles, together with that of the interosseous ligament, by means of the

catling, a kind of long, narrow, double-edged knife.

It is of great consequence that the knee should be bent, when the gastrocnemius and soleus are to be divided, as these muscles will then be cut through much lower down, than they would be, if the leg were extended, so as to put them in a state of tension.

In amputating below the knee, very particular care must be taken to cut every fasciculus of muscular fibres, before using the saw. Every part, except the bones, being divided, the soft parts are next to be protected from the teeth of the saw, by a linen retractor, made with two slits to receive the two bones.

On the leg, there are only three principal arteries, requiring ligatures, viz. the anterior, and posterior tibial, and the peroneal, arteries.

Whether the above plan of amputating the leg so high up, when the foot, or ankle, is the part diseased, or injured, be on the whole most advantageous, I cannot presume to determine. There are certainly many clever men who condemn the practice, and though we see it pursued by the best surgeons in this metropolis, yet, we may safely assert, that the matter requires further consideration. If it were a decided point, that the common custom of bending the knee, for the sake of bearing the weight of the body on its anterior part, were the only one admissible, after amputation of the leg, there could be no doubt of the propriety of performing the operation a little way below the knee, in preference to any other situation. But, since there have been numerous instances of persons walking very securely with machines, which allow them to make use of the knee, and are more pleasing to the eye, on account of their perfect resemblance to a natural limb; and since also, the operation at the lower part of the leg, is more easy of performance, and safer, than when done high up; some very eminent surgeons have thought that it ought always to be done near the ankle, when possible, instead of near the knee.

Mr. White of Manchester, in a paper dated 1769, (*Med. Obs. and Inq. Vol. 4.*) informs us, he took the hint to amputate a little above the ankle, from seeing a case, in which this had been done by a simple incision, with such success, that the patient could walk extremely well, though with a machine, that was very badly constructed. After this Mr. White began to operate above the ankle with the double incision; and he invented a machine much better calculated for the patient to walk upon.

In 1773 Mr. Bromfield published his

Chirurgical Cases and Observations, where in he mentions his having begun about the year 1740 to amputate above the ankle, in a case of gangrene of this part of the leg. The patient walked so well, with the aid of a very simple machine, both along a level surface, and in going up and down stairs, that it was difficult to perceive he had lost his foot. Mr. Bromfield was persuaded, however, to give up this practice, until he learnt, in 1754, that a Mr. Wright had thrice amputated in this way with success, when he again had recourse to it, without the least unpleasant consequences.

The operation just above the ankle is less painful, because there is not so much substance to be divided, as in the calf. There is also more facility in covering the bone entirely with skin. The wound would generally require less time to heal; its smaller size, and the greater exactness, with which its opposite edges can be brought into contact, are circumstances, which would fully warrant this conclusion, even were the sentiments of experienced men totally out of the question.

The advantages of amputating a little below the knee, is that pressure on walking with a wooden leg, is entirely confined to the front of the limb, and the cicatrix itself is subjected to no sort of irritation whatever. After amputating at the ankle, the pressure in walking operates directly on the cicatrix; but, if the mechanical contrivances for walking are now brought to such perfection, that this pressure does no harm, the operation should not be abandoned on this account.

AMPUTATION WITH A FLAP.

This was first proposed by Loudham, an English surgeon, and published by Jacob Young, in 1679, in his *Curvus Triumphalis ex Terebinth*. It was successfully practised by several others; but soon fell into disrepute, probably in consequence of the rude measure adopted for stopping the hemorrhage, and the badness of the treatment of the stump, by which causes, pain, inflammation, and extensive suppuration must have been produced.

The following historical account of the flap amputation was drawn up by the celebrated M. de la Faye, and is inserted in the *Memoires de l'Acad. de Chirurgie*, Tom. 5, Edit. in 12mo. Being desirous of bringing into this dictionary as much of the valuable matter of those highly admired memoirs, as I conveniently can, I shall now present the reader with the whole of La Faye's observations on this subject. In perusing the account, it is to be recollected, that La Faye was a zeal-

ous advocate for the method, which, though at present thought well of by a few, is not extensively approved. La Faye's relation, however, is truly interesting, for it makes us at once acquainted with all the principal arguments and reasons, which have been adduced in favor of the operation, and it explains to us the different plans of performing it, which were followed by such surgeons, as made the earliest trials of it. The description of the new machine for compressing the stump is less interesting now, than formerly, when a main argument in support of this operation was, that the flap, when applied and pressed upon the stump, stopped the bleeding, and rendered ligatures unnecessary. I have chosen, however, not to omit the account of the instrument, in order that the reader may possess the whole of the memoir.

MEMOIR BY M. DE LA FAYE ON THE FLAP
AMPUTATION.

Though surgeons have diligently applied themselves, for more than a century, says La Faye, to bring the ordinary method of amputation to perfection, yet still there are such defects found in it, as the greatest masters have not been able to remedy. According to this method, a ligature is put on the vessels, which produces great pain, and sometimes convulsive motions in the patient: the bones remain bare, and must exfoliate, which requires a considerable time; it has been sometimes necessary to saw them a second time; the wound is of a large extent; the suppuration, which is very copious, greatly debilitates the patients, and the cure becomes exceeding tedious.

The reflections, made by several surgeons at the end of the 17th century, as well as by those of the present, on these inconveniences, have induced them to think, that, by preserving a flap of flesh and skin, for covering the stump, the operation would be rendered less painful, more certain, and the cure much quicker. From this portion of flesh, the new method of taking off a limb, has been stiled the flap-amputation. I shall here examine the different notions of those, who have invented or followed this method, and propose such as have occurred to me on this subject.

The amputation, with the double incision, is very recent; though it has been surmised by some persons, that Celsus had pointed it out in the following words, lib. 7, c. p. 33. *Levanda est, supràque inducenda cutis, quæ sub ejus modè ciratione laxa esse debet, ut quàm maximè indigne contegat.* "The skin, which in this sort

of operation, ought to be lax, must be drawn upwards, to the end that it may be afterwards brought down, so as to cover the bone as much as possible." For my part, I cannot discover in these words any thing else besides the ordinary method, and nothing like an amputation, where a flap is preserved to cover the stump. It is in the *Acta Eruditorum* of Leipsic, of the year 1697, that we must search for the epocha of this new method. We there find a book quoted, which was written in English, with this Latin title, *Currus triumphalis ex Terebenthina*, published in 1679, by Jacob Young, an English surgeon, with the extract of a letter, which this author has printed at the end of his book. In this letter, mention is made of one Loudham, an Englishman, who had invented a new manner of amputation. According to this method, a piece of flesh and skin is preserved, on one side of the part which is to be cut off, and applied on the stump, after the separation of the limb; which abridges the time of the cure, and facilitates the application of a wooden leg. At first, the utility of this method was not much attended to. But eighteen years afterwards, that is to say, in 1696, Verduin, a famous surgeon of Amsterdam, after having put it in practice, wrote a Latin dissertation on this head, printed at Amsterdam the same year, which M. Manget has inserted in his *Bibliothèque Chirurgique*. The next year, an extract was made of it at Leipsic, as already observed. In 1702, Sabourin, a very able surgeon of Geneva, proposed it to the Royal Academy of Sciences, which suspended its judgment, till they had such proofs as experience might furnish them with. It is not known whether Verduin and Sabourin had read Young's book; so that it cannot be ascertained, whether we ought to attribute to them the glory of having invented this new method. We cannot, however, refuse them, at least, that of having brought it into vogue. Verduin contrived certain bandages; and Sabourin extended this practice of amputating with the double incision, even to the articulations.

The imperfections, which Verduin discovered in the manner of amputating then in vogue; the embarrassment caused by the apparatus, and the danger of a mortification, made this practitioner out of conceit with the ordinary method. The facility wherewith nature re-unites the divided parts (a circumstance more especially observed in the operation of the hair-lip, and in wounds of the head, where the cranium is found denuded) was the principal motive that induced him to search out, or to follow the new method.

He was for some time stopped by a considerable difficulty. He knew not whether flesh would unite with a bone which had been sawn, and full of marrow. Hippocrates, Celsus, Paul D'Egina, Paré, Tallicotius, the Fabricii, and several other authors, whom he consulted, afforded him no light on this head. Moreover, he dreaded the effects of envy and calumny; but a letter, he received from a friend, who had been formerly his pupil, removed all his scruples. This letter informed him, that the method he was so anxious about, had been practised with all possible success, by a famous surgeon of London. Perhaps this surgeon was Loudham, of whom we have made mention. This seems to prove that Verduin had really invented what another had found out, eighteen years before him. The description, which he has given of his new method, is so perfect, that those who have written after him, have been able to add but very little to it. Here follows an extract of it.

Two compresses are applied, one under the ham, and the other on the *cour* of the large vessels. The thigh is wrapped in a fine linen cloth, which is sustained by some turns of a roller. The whole part is encompassed with a strip of dressed leather, six inches broad, furnished with three straps with buckles, to secure it round the part. The tourniquet is placed in the usual manner. The part, above the place intended to be amputated, is surrounded with a leather strap. The leg, being held by the assistants, the left hand is clasped round the calf, below the second ligature. The point of a crooked knife, which is made to pass as near as possible to the bones, is thrust in on one side, so as to come out on the other. The knife is made to descend pretty near to the *tendo achillis*, and thus separates almost the whole calf of the leg, to which it is held only by the upper part, and which is raised towards the thigh; after which the operation is finished in the ordinary manner. The wound is then washed with a wet sponge, to clear it of the fragments of the sawn bone. The leather strap, which served to secure the flesh, is loosened; the calf of the leg is clasped on the stump; it is a little compressed, by pushing it from the hinder towards the fore part. In order to maintain it, the wound is dressed with *lycoperdon*, lint and tow. The whole stump is wrapped up in a bladder, which is sustained by slips of sticking plaster. On this bladder are applied a compress, and a concave plate, which are sustained and compressed by means of two straps crossing each other, and attached to the large leather strap which surrounds the thigh.

For the second apparatus, an instrument of tin, called by Verduin, *soutien*, is made use of. It is furnished with a compress, and composed of three pieces; the one a kind of *goutiere* or hollow, the other a sheath, and the third a plate. The *goutiere* contains the hinder part of the thigh, as far as the articulation of the knee. The sheath, which is fastened to the *goutiere*, covers the hinder part of what remains of the leg. The plate covers the surface of the stump, and is joined to the sheath, by a lamina, that passes between the two bits of tin, which compose this second piece, and maintained by means of a screw. The use of this third piece, is, to sustain the flap, which is applied on the stump, by compressing it, but gently, for fear of bruising it. Verduin and Ruysch, Mess. Manget and Garengéot have given the figures of all the instruments, of which we have been speaking.

The dissertation of Verduin has been printed in Dutch, High-German, Latin, and French. Almost all the authors, who have made mention of it, such as Ruysch, Reverhorst, Goelick, Verduc, Mess. Manget and Garengéot, speak in its favour, and give an extract of it.

M. De Garengéot has, notwithstanding, thought it necessary to make several alterations in this method. He says, that, to keep the flesh firm, any other strap may be made use of, besides a leather one; and that it ought to be placed on the tuberosity of the tibia. He prefers to Verduin's crooked knife, that of M. Petit with the double edge. He would have the semicircular incision made, before that by which the flap is separated. He prescribes the giving some strokes, with the point of the knife, on the extremity of the bone which is to be preserved, and to raise the flap with a slit compress, whilst the bone is sawn. He advises the cutting off the overplus of the flap applied on the stump, and to sustain it by some stitches; or rather to employ the dry suture, which, according to him, is much better.

After the testimony of so many illustrious authors, it is astonishing that Heister, in the new book of surgery, which he has lately published, should say, that few authors approve this new method; and that it has been discarded by the English, and even by Verduin himself. He pretends that the hemorrhage, and several other accidents, which are often, as he imagines, the consequences of the new method, have caused the death of a patient, on whom Sabourin had practised it, at the *Charité* of Paris. Duverney and Mery, who have given an account of this case to the Royal Academy of Sciences, have not formed the same judgment of it as Heister; and we

know what regard ought to be paid to the sentiments of those gentlemen.

Junkers, in his book, entitled, *Conspicuum Chirurgia*, thinks, that the new method occasions a great deal of pain; but if it be compared with the old one, it will be readily allowed, that this causes much more. The strongest objection which Mess. Heister and Junkers have advanced against the amputation with the flap incision, is as follows: the little eminences of the amputated bones, prick the flesh wherewith they are covered, and excite inflammatory pains. In this kind of amputation, the bones are covered with a flap of flesh and skin; consequently the patient is exposed to painful prickings and inflammation. But these inequalities, says La Faye, do not appear to me capable of producing these accidents. I have seen many fractures without this effect, although they had not been reduced, and the flesh must have touched the asperities of the fractured bones. I have even examined some of these fractures, after the death of the subjects; and have found, a year after the accident, that the ends of the bone were glued, and firmly adherent to each other; and that the surface of each extremity of the bone had no asperity, but was, on the contrary, even and smooth like a nipple. Hence it appears, that we ought to be under no apprehension, either before or after the cure, of the flesh being pricked by the inequalities of the sawn bone. Besides, experience, which, in matters of practice, must always prevail over reasoning and speculation, is sufficient to answer the objection. M. Manget, in his *Bibliothèque de Chirurgie*, says, that Sabourin had performed the operation of the flap amputation on a man, who was afterwards seen to walk with ease in Geneva, whose streets are on a declivity. M. Garengéot, in the first edition of his operations, relates, that M. Petit has seen officers, on whom the new method had been practised, dancing and leaping with their artificial legs, as if they had been real ones.

The advantages, which Verduin attributes to this method, are very considerable. He pretends, in the first place, that the flap, applied on the orifices of the vessels, stops the hemorrhage, without ligature, and without astringents. Secondly, that there is less danger of a gangrene. Thirdly, that there is no exfoliation of the bones; and that the cure is much quicker, and the cicatrix less unsightly. Fourthly, that a wooden leg is much better adjusted to the stump; and that the patient walks with greater freedom. Fifthly, that the patients feel no sympathetic pains, which follow from the amputation performed in the ordinary manner. Ruysch adds, that

bad symptoms are less to be apprehended after this operation, because the nerves, the bones, and the tendons, are covered with their proper teguments.

Of these six advantages here enumerated, says La Faye, I can discover no more than four which have any existence: to wit, the quickness of the cure, from the bones not exfoliating; the facility of applying a wooden leg; the inutilty of the ligature and astringents, which are supplied by the flap; and, in fine, the small portion of sensible parts, which is left exposed to the air. It ought to be observed here, that Verduin seems as though he would say, that the flap is generally applied on the orifice of the vessels. Nevertheless, it is evident, that, of the three arteries, which are distributed to the leg, namely, the *tibialis anticus*, the *tibialis posticus*, and the *peronæus*: it is the first only, which, properly speaking, is compressed by the flap; the two others being in the flap itself, are not compressed by it, but in it, by the apparatus.

As to the other advantages, that which Verduin supposes, by saying, that there is less danger of a mortification, does not appear to me well grounded; on the contrary, the compression of the flap ought to make it apprehended; whereas, in the ordinary method, it cannot be the consequence of the operation. What he says of the sympathetic pains, which are not felt, according to him, after the operation, is contrary both to experience and reason. In the first place, it contradicts experience; for, Ruysch informs us, that a patient, on whom this operation had been performed, was sensible of pain at the extremity of the arm, at the fingers, and at the amputated hand, when his stump was compressed; that when the stump was bent, he fancied that the fingers of the hand, which no longer existed, were bent also; and that, when they rubbed him above the articulation of the joint, and even at the side of the breast, he imagined that he felt his fingers. In the second place, it is contradictory to reason; for, the immediate cause of sympathetic pains, is the action of the nerves, which, after the amputation of a limb, is produced in the brain, in the same manner as it was before the amputation. Now let me ask, whether a flap, which is left, on making an amputation, can prevent this action from being produced, as it certainly would be, if no flap at all had been left. The advantages, therefore, of the new method, must be reduced to the four we have mentioned; and if we add to these the success it has met with, we must look on the invention of it as very useful in certain cases.

I have already spoken of two operations performed according to this method; and shall now relate three others, which have perfectly well succeeded. The first was in the hospital of Amsterdam, on a man thirty years old; the history of which is given by Verduin. The second was performed by Verduin's son-in-law, on a boy sixteen years old, who had a painful and ulcerous tumour in one of his hands. This fact is related by Ruysch in one of his letters. Van Ulooten performed the third, on a man exceedingly lean, who had a spina ventosa. The leanness of the patient made it necessary to begin the incision, by which the flap was to be formed, at the tendo achillis. He did not lose three ounces of blood. The tourniquet was left on him till the nineteenth day, and the wound dressed like a simple one. The flap, which, at first, greatly exceeded the surface of the stump, retired four fingers breadth, towards the end of the cure. This is related in a letter which Verduin has inserted in his treatise of operations. To these instances, must be added those produced by Loudham and Verduin. I say nothing here of those operations which have been performed by Garengéot, as he himself has promised us a detail of them.

Such has been the progress of art, with regard to amputation, ever since the invention of the new method of Verduin and Sabourin, till the year 1739, when Ravaton, surgeon-major of the hospital of Landau; and afterwards M. Vermale, seriously reflecting on the ordinary method of amputating limbs, especially the thigh, each of them proposed to the French Academy a kind of amputation with the double incision, different from the method of Verduin and Sabourin. Instead of preserving only one flap, as these practised, they advise the forming of two flaps; that the bone should afterwards be sawn, a ligature made on the vessels, and the two flaps applied, in order to procure their speedy re-union, and prevent the exfoliation of the bone, and too copious a suppuration.

However, there is some difference in their method of forming these two flaps. Ravaton makes three deep incisions down to the bone; first a circular one, with a crooked knife, within four fingers breadth of the bone intended to be sawn; he afterwards makes, with a knife somewhat larger, the two others perpendicularly on the first, beginning at the place where the limb is separated, the one at the fore part, and the other at the hinder; and taking care not to touch the principal vessels; he detaches, in fine, the two flaps from the bone.

Vermale makes only two incisions, to form the two flaps. His dimensions must be taken very exactly. When he has fixed the tourniquet, as it ought to be in all amputations, he surrounds the part with two red threads, at the distance of four fingers breadth from each other; one at the place where the bone is to be sawn; the other at the place where the incision of the flaps is finished. He afterwards directs, to the fore part of the limb, the point of a bistoury, seven inches long, which he thrusts down to the bone: he makes it turn round the circumference, that it may come out by the opposite part; then directing the edge of the knife along the bone, he cuts down to the inferior thread, where he separates the first flap, which, by this incision, is made, as the author says, of a round or conic figure at the extremity. He makes, in fine, in the same manner, the second flap on the interior side of the part, in case he has begun by the exterior side, and *vice versa*.

Ravaton and Vermale both finish their operation in the same manner. They raise the flaps, and sustain them, when thus raised, by means of the slit compress; they cut away the rest of the flesh, and separate the periosteum, as usual. They recommend the sawing of the bone with a saw, whose teeth must be fine. They make a ligature on the vessels; let the strings hang by that part of the wound, which has the greatest declivity, draw the flaps together, and secure them by languettes or cross-cloths (at the extremity of which there is spread a sticking plaster,) and by an apparatus, which may be easily conceived.

The manner of M. Vermale's forming the flaps appears to me, continues La Faye, to have the advantage over that of M. Ravaton; but, instead of the straight bistoury, which M. Vermale makes use of, I would have one employed that is longer, and at the same time a little incurvated on its flat, that it may the better lay hold on the convexity of the bone, and run over it more easily than can be done by the straight bistoury.

This method is less tedious and less painful, from the manner of forming the flaps; and they are hereby more exactly applied to each other, because the skin and flesh are cut in such a manner, as to facilitate their adjustment: they must also be more speedily re-united, than if they had been formed after M. Ravaton's method; which is an improvement of his manner of amputation, by preserving two flaps. But, at the same time, it must be acknowledged, that it is difficult, if not impossible, to cover exactly, by means of two flaps, the bones of the leg, after they

have been sawn; and that, on the contrary, this may be perfectly well done with one flap only. The method of M. Verduin has this further advantage, that it may be practised on the thigh, the fore-arm, and the arm, in all cases; but especially when one of the sides, which should be preserved for forming the two flaps, has undergone any alteration. So that, I think, proceeds La Faye, we shall always be greatly obliged to Verduin and Sabourin, for what they have invented; and, that those, who shall do their endeavour to bring it to perfection, will not have lost their time. This is what has induced me to attempt to remedy some defects, which I find in the first and second apparatus of both their methods.

The laying on of the first, appears to me extremely embarrassing. I know not whether it is easy to obtain, with a slip of leather, the just degree of compression which ought to be made on the vessels.

The instrument, which Verduin calls *soutien*, and is employed by him in the second, must compress the stump, by means of the plate. In order to make the compression properly, it must have a fixed point; the plate, it is true, has one with respect to the sheath, and to the *goutiere* or hollow; but, says La Faye, I do not see, that the *goutiere* has any. To remedy this inconvenience, I have contrived an instrument composed of three pieces, namely, of a *goutiere* or hollow of tin, pretty much like that of the *soutien* of Verduin; of a plate, of the same metal, made a little concave; and of a screw.

The *goutiere* or hollow, in which the thigh is placed, is furnished with a cushion; it is fastened by three leather straps, every one of which has a buckle, to a very broad belt, of the same kind, which goes round the body, near as high as the *os ileum*, and is maintained *in situ*, by a buckle. Each of the leather straps passes through an aperture, or flat ring, formed in that part of the *goutiere*, which regards the top of the thigh.

The plate has two parts: the first is round, and something concave, and applied on the surface of the stump: the second makes a long square, whereon the hinder part of the stump rests, which, together with the thigh, must form an angle somewhat obtuse. Each of these parts is likewise furnished with a cushion.

The screw is placed in a small frame of copper. This frame is composed of two parts, the one fixed, the other moveable. The fixed part, which is fastened by two screws to a little tin-plate, has, at the extremity, which is towards the *goutiere*, an hinge or joint with five knuckles, and two segments of a circle, which run the

one on the other. One of these segments has an opening to permit the motion of the hinge, and to fix it at one's pleasure, by means of a screw, which passes through the slit, and is wormed on the other part. The end of the hinge is joined to the *goutiere* by means of two screws.

On the fixed frame, which is made sloping at top, and chamfered on its inner part, in the form of an half swallow's-tail, are placed two small cross-pieces tapped, which serve as a nut to the screw, and are each of them fastened by two other small screws.

The moveable frame rises to a square, or right angle, being fastened with two wormed screws to the round plate, which is made a little concave. It is composed of two parallel branches, and chamfered both within and without, to fill the two swallow-tails of the fixed frame, wherein it runs, as well as in the two cross pieces, which serves as a nut. The second part of the plate, which forms a long square, is applied on these two branches, and can run under another plate of the same breadth, to which the fixed frame is fastened.

At the angle of the square, is a round socket, wherein passes the square top of the screw, which is about four inches and an half in length. Beneath the socket, is a piece, which serves to direct the large screw and is stopped under the square, by means of two screws, which pass through the part of the socket and the square, and are wormed in the part of this direction.

Before the operation is begun, M. Petit's tourniquet must be placed, and left on during the cure. After the operation is over, the flap, which has been preserved, is applied on the stump, and immediately sustained with two bandages of two fingers breadth, and covered at their extremities with a sticking plaster. These bandages must be laid cross-ways on the surface of the stump, and applied by their extremities on the sides. The instrument I am speaking of, continues La Faye, is then to be placed. The thigh must be put in the *goutiere*, there must be fastened round the body the broad belt, which is to make its fulcrum or point of support, by means of the three leather straps. The stump, being at the same time supported on the long square of the machine, the concave and round plate will make on its surface, which is covered by the flap, the necessary compression, by means of the screw, the use of which is, to graduate the compression, by putting the plate in action. The wound is to be covered with lint, and proper compresses. In fine, the tourniquet must be loosened, that the vessels may furnish as much blood as shall be requisite for

the nourishment of the stump, and of the flap: but care must be taken to loosen it no more than may be necessary for this purpose. With this precaution, a moderate compression of the concave plate will be sufficient to stop the hemorrhage, and to prevent the dangers, to which a strong compression exposes the parts whereon it is made.

The description of the machine here proposed, suffices to give an idea of its advantages. In the first place, it has a fixed point. The plate is joined to the goutiere by an hinge, which is rendered immoveable, after it has been opened as much as may be judged convenient; and the goutiere has a fixed point; by means of the straps which are fastened to the leather belt. Secondly, this instrument is made use of, after the operation is finished, and left on, during the whole course of the cure; so that there is here only one apparatus; whereas Verduin proposed two. Thirdly, we may easily see, from the beginning of the cure, the state of the wound and dress it, without altering any thing in the compression. Fourthly, the round and concave plate does not only keep the flap fast on the extremity of the stump, but makes a gentle compression on it, just as strong as is necessary, and equal in every point. Fifthly, the machine which I propose, says La Faye, would be proper in this method of amputation, even were we to make a ligature on the vessels. (*Mem. de l'Acad. de Chirurgie, Tom. 5, Edit. in 12mo.*)

I shall now insert the observations published on this subject by Garengot in the *Mem. de l'Acad. de Chirurgie, Tom. 5, in 12mo.*

MEMOIR BY M. DE GARENGOT ON THE
FLAP AMPUTATION.

It is about twenty years ago, that I performed, at Mantes, in presence of M. Quesnay, the flap amputation, according to the method of Verduin and Sabourin, on a mason, whose right leg and foot had been fractured. We know that they made no ligature on the vessels, and that their intention by this method was, that the flap, being applied on the stump, and sustained by a particular apparatus which they have described, should reunite itself to the stump, and thereby stop the hemorrhage.

The above mentioned patient, who was dangerously wounded in several other parts of his body, died on the third day after the operation; and though it cannot be absolutely said that this was owing to the hemorrhage, yet must it be allowed, that it had a considerable share in it.

As the multiplicity of machines describ-

ed by the inventor, has no other end, but to contain the flap so near the orifice of the vessel, that they might be exactly compressed and closed up; my reflections on this head induced me to think, that, to obtain a just degree of this compression was very difficult, as the most considerable vessels are situated between the two bones, and all the vessels in general, when they are cut, withdraw themselves, so that it seems almost impossible that the flap should compress vessels thus retracted, and closed round with two extremities of bone. It was my opinion, therefore, that a stop ought to be put to the hemorrhage, by means of the ligature, which is always the surest expedient; and I resolved to practice it on the first occasion that offered, and at the same time, to do it in the simplest manner, so as to render the operation easy, that I might draw all possible advantages from it.

With this view it was, that I performed, twelve years after the operation I have been speaking of, the flap amputation of the arm, on a soldier of the king's regiment of infantry: but I preserved two flaps, according to the method communicated to the Academy by M. Ravaton. I made a ligature on the brachial artery, and left the thread in the inferior angle of the division. I omit giving a detail of the apparatus, and shall only observe, that the bone was exactly covered; that the patient was only dressed every two or three days; that the compresses were dipped sometimes in brandy, sometimes in sea-water, to stop the suppuration; that the ligature fell off the eighth day; and that, on the twenty-eighth, the patient was perfectly cured, without any exfoliation.

I made a third experiment of this operation on a soldier of the same regiment, dangerously wounded in the right foot by the bursting of a bomb, which fractured the inferior part of the two bones of the leg, and several of the foot.

I did not make the amputation of this leg till the eighth day after the wound, from the opinion I entertained that gunshot wounds, in general, when attended with fracture of the bones, produce a terrible disorder in the nervous system, whence commonly result the most fatal accidents; and that it is more prudent to wait till nature is restored, if I may use the expression, to her ordinary situation.

In this operation, I left only one single flap; but having reflected, that the too quick adhesion of this flap to the stump, might render the extraction of the ligature very difficult, I made use of a further precaution, which was as follows.

After having made the ligature of the vessels as usual, I cut the threads to the

length of seven or eight fingers breadth; I surrounded them with a compress four times double, an inch broad, and of the same length as the threads. I applied one of the ends of this little long compress, between the two bones, on the vessels, which had been tied up, and the other end was placed on the side with the threads; after which I raised the flap, in order to adjust it to the stump, and then laid on, not the apparatus used by M. Verduin, but the common sort, or pretty nearly the same that is generally employed in the amputation of the leg; by which means, the method of cure becomes more simple, as I make no use of the machines invented by this author and M. La Faye.

I did not take off this apparatus till the fourth day; when I found the flap adherent, with a gentle heat. The longuette or small compress, which hindered the reunion of the flap, in that place alone which it possessed, was simply humid. I drew it out with facility, on the eighth day after the operation; and as I found such resistance from the ligature, as made me presume that it would not fall off so soon as I expected, I cut it in the loop with blunt scissars, which were directed into the space of the sinus formed by the presence of the compress. I afterwards joined it together again, by applying an apparatus like that which had been put on, at the instant of the operation. I did not remove it till three days after, and saw with pleasure the flap firmly reunited, though a portion of it had been applied on the linen for eight days.

The patient was cured on the twenty-seventh day of the operation, and could easily bend and stretch out the extremity which remained of the leg.

I am not insensible, that some surgeon-majors of this regiment have performed this operation; but by following Verduin's method too exactly, it has proved unsuccessful. I am persuaded that the alterations I have already made in it, are of some consequence, and I should still add more, did I see any occasion for making them.

What I have experienced in my third patient, would induce me to make the ligature, in such a manner, that it might exactly embrace, if I may use the term, no more than the vessel, in order to its falling off more speedily, and sooner re-uniting the flap.

I am still of opinion, that if the ligature should not fall off, so soon as we apprehend it has produced its effect, it would be necessary to cut it; because its too long continuance must naturally obstruct the advantages proposed from this operation, with regard to the speedy re-union. But

as it is not very easy to cut the ligature very close, I should make use, in preference to other remedies, of the agaric of oak, whose success is well known. Two pieces of this fungus, each fastened by a string, (to one of which there should be made a knot to distinguish them) being afterwards applied, the one on the other, to the orifice of the vessels, and the two strings covered by the long compress abovementioned, would certainly stop the hemorrhage: the whole being withdrawn in the space of three days, there would need no more than the same space for the whole flap's adhering to the stump, and the cure would be perfectly completed in a short time after.

As to what remains to be said on this subject, although I am convinced, says Garengot, that the method of amputation with a flap, has some advantages, which the others have not; it is not my present design to examine into the reasons of the preference, but only to deliver what has occurred to me on this head, and to propose such alterations as I thought, might render the operation more perfect. (*M. de Garengot, in Mémoires de l'Acad. de Chirurgie, Tom. 5, in 12mo.*)

SUBJECT OF AMPUTATION WITH A FLAP CONCLUDED.

We have already spoken of the flap-operation having been done by White and Bromfield above the ankle. In the year 1765, Sylvester O'Halloran, an eminent surgeon, of Limerick in Ireland, published a revival of the flap-amputation, upon a plan entirely new. However, his fault consisted in not putting the flap in contact with the wound, till after the inflammation had subsided, about the twelfth day.

Messrs. Alanson and Lucas conjectured that the cure might be rendered more safe, easy, and expeditious, by applying the flap, with a view of uniting it by the first intention.

The following case explains Mr. Alanson's flap-operation. The disease was in the left leg, the patient, therefore, lay on his right side, upon a table of convenient height, so as to turn the part to be first cut fully into view. The intended line, where the knife was to pass in forming the flap, had been previously marked out with ink. A longitudinal incision was made with a common scalpel, about the middle of the side of the leg; first on the outside, then on the inside, and across the tendo Achillis: hence, the intended flap was formed, first by incisions through the skin and adipose membrane, and then completed, by pushing a catling through the muscular parts in the upper incised point, and afterwards

carrying it out below, in the direction of the line already mentioned. Thus the whole flap was completed. The flap was thick, containing the whole substance of the tendo Achillis. The usual double incision was made; the retractor applied to defend the soft parts; and the bone divided, as high as possible, with the saw.

The flap was placed in contact with the naked stump, and retained there, at first by three superficial stitches, between which adhesive plasters were used. Notwithstanding the patient caught an infectious fever, a few days afterwards, the stump healed in three weeks, except half an inch at the inner angle, where the principal vent had been. In another week, the wound was reduced to a spongy substance, about the size of a split-pea. This being touched with caustic, healed in a few days. The man was soon able to use an artificial leg, with which he walked remarkably well. He went several voyages to sea, and did his business with great activity. He bore the pressure of the machine totally upon the end of the stump, and was not troubled with the least excoriation or soreness.

In the next instance, in which Mr. Alanson operated, he formed the flap by pushing a double-edged knife through the leg, and, passing it downwards and then outwards, in a line, first marked out for the direction of the knife. In this way, the flap was made more quickly. (*Alanson on Amputation.*)

The leg should be completely extended during the operation; and kept in that posture, till the wound is perfectly healed.

We shall next notice Mr. Hey's method. This gentleman is satisfied, that very near the ankle, is not the most proper place for this kind of amputation.

Some cases occurring, in which, from a scrophulous habit, the wound at the stump would not heal completely, nor remain healed, Mr. Hey determined to try, whether amputation in a more muscular part would not secure a complete healing, and give the patient an opportunity of resting his knee on the common wooden leg, or using a socket, as he might find most convenient. Mr. Hey now prefers this method, and has reduced it to certain measures.

It had been customary, at the Leeds Infirmary, to make the length of the flap equal to one-third of the circumference of the leg. This was determined by the eye of the operator, who usually pushed the catling through the leg, near the posterior part of the fibula. Mr. Hey, finding the flap was not always of the proper breadth began to determine this by measure, and now operates as follows: to ascertain the

place where the bones are to be sawn, together with the length and breadth of the flap, he draws upon the limb five lines, three circular, and two longitudinal ones. He first measures the length of the leg from the highest part of the tibia to the middle of the inferior protuberance of the fibula. At the mid-point, between the knee and ankle, he makes the first or highest circular mark upon the leg. Here the bones are to be sawn. Here Mr. Hey also measures the circumference of the leg, and thence determines the length and breadth of the flap, each of which is to be equal to one-third of the circumference. In measuring the circumference of the limb, Mr. Hey employs a piece of marked tape, or ribbon, and places one end of it on the front edge of the tibia. Supposing the circumference to be twelve inches, he makes a dot in the circular mark on each side of the leg, four inches from the anterior edge of the tibia. These dots must, of course, be four inches apart behind. From each of these dots Mr. Hey draws a straight line downwards, four inches in length, and parallel to the front edge of the tibia. These lines shew the direction, which the catling is to take in making the flap. At the termination of these lines, Mr. Hey makes a second mark round the limb, to shew the place where the flap is to end. Lastly, a third circular mark is to be made an inch below the upper one, first made, for the purpose of directing the circular cut through the integuments, in front of the limb. The catling, for making the flap, should be longer than those commonly employed in amputations. Mr. Hey uses one which is seven inches long in the blade, and blunt at the back, to avoid making any longitudinal wound of the arteries, which is very difficult to close with a ligature, and, for the same reason, he pushes the catling through the leg a little below the place where such muscles are to be divided, as are not included in the flap. The limb being nearly horizontal, and the fibula up-ward, he pushes the catling through the leg, where the dot was made, and carries it downward along the longitudinal mark, till it approaches the lowest circular mark, a little below which the instrument is brought out. The flap being held back, Mr. Hey divides the integuments on the front of the limb along the course of the second circular mark. The muscles not included in the flap, are then divided a little below the place where the bones are to be sawn. No great quantity of these muscles can be saved, nor is it necessary, as the flap contains a sufficient portion of the gastrocnemius and soleus muscles to make a cushion for the end of the bones. After sawing

the bones, Mr. Hey advises a little of the end of the tendon of the gastrocnemius to be cut off, as it is apt to project beyond the skin, when the flap is put down; and he recommends the large crural nerve, when found on the inner surface of the flap, to be dissected out, lest it should suffer compression.

As strips of adhesive plaster cause great pressure on the end of the stump, Mr. Hey prefers using sutures for keeping the flap applied. Small strips of court plaster are to be put between the ligatures. The sutures may be cut out on the eighth or ninth day, and the flap supported by plasters.

Mr. Charles Bell describes another sort of flap-amputation. The operation is not to be done so low, as there will not be a sufficiency of muscle to cover the end of the bones. An oblique cut is to be made with the large amputating knife, upward, through the skin of the back part of the leg. The assistant is to draw up the skin, and the knife is to be again applied to the upper margin of the wound, and carried obliquely upward till it reaches the bones. The knife, without being withdrawn, is next to be carried, in a circular direction, over the tibia and fascia, covering the tibialis anticus, until it meets the angle of the first incision on the outside of the limb. The surgeon is then to pierce the interosseous membrane, &c. The sawing being completed, and the arteries secured, the flap is to be laid down, and the integuments of the two sides of the wound will be found to meet. (See *Bell's Operative Surgery*, Vol. 1.)

The flap-amputation is certainly more painful than the common method, and, though it has had very able men for its patrons, it is questionable, whether it is productive of the smallest advantage. Nor is there any necessity for adopting this kind of operation, though you may choose to amputate near the ankle. Mr. Lucas (*Med. Obs. and Inq.* Vol. 5.) does indeed endeavour to prove, that the stump will not bear the pressure of a machine for walking unless a flap be preserved. However, as the author of the article *Amputation*, in the *Encyclop. Méthod.* remarks, if care be taken to save muscle, a machine for walking may be worn as conveniently as if a flap had been made.

The flap-amputation of the thigh is now quite abandoned by all the best surgeons in this country, and no description of it seems necessary. Foreign surgeons, however, seem not to have entirely rejected this way of operating. We read in Desault's works, by Bichat, that the former was in the habit of adopting this kind of amputation; but, it is a justice due to the

eminent M. Sabatier, to state his disapprobation of the practice. (*Médecine Opératoire*, Tom. 3, p. 257.)

Some criticisms on the flap-amputation, by the intelligent M. Louis, will be found among the observations, which I have taken from the valuable writings of that eminent surgeon, and inserted at the end of the present article.

AMPUTATION OF THE ARM.

The structure of the arm is very analogous to that of the thigh; like the latter, it contains only one bone, round which the muscles are arranged. The interior ones are attached to the os brachii, while the more superficial ones extend along the limb, without being at all adherent. The first consist of the brachialis internus, and the two short heads of the triceps; the second, of the biceps, and long head of the triceps. Hence, amputation is here to be done in the same way as in the thigh, unless when we are necessitated to amputate very high up, above the insertion of the deltoid muscle.

The patient being properly seated, the arm is to be raised from the side, and, if the disease will allow it, into a horizontal position. The surgeon is to stand on the outside of the limb, apply the tourniquet as high as possible, and to have the skin and muscles which he is about to divide, made tense, by the hands of an assistant. The soft parts are next to be divided, as much of the limb being preserved as possible. The bone is to be sawn with the usual precautions, and the bleeding stopped in the usual way. The stump is then to be dressed, and the patient put to bed, with the wound a little elevated from the surface of the bedding.

If the disease should require the arm to be taken off at its upper part, there would be no room for the application of the tourniquet. A compress might then be put in the axilla, and compressed by any strong bystander. With a straight bistoury, the surgeon is now to make a transverse incision down to the bone, a little above the lower extremity of the deltoid muscle. Two other longitudinal incisions, made along the front and back edge of this muscle, would form a flap, which must be detached and reflected. Lastly, the rest of the soft parts of the limb are to be divided by a circular cut, made on a level with the base of the flap. (*Sabatier Médecine Opératoire*, Tom. 3, p. 242, 243.)

With regard to placing a compress on the artery in the axilla, as advised by Sabatier, this is not so eligible, as mak-

ing pressure on the artery, as it passes over the first rib, and of which method we shall speak when we treat of amputation at the shoulder.

AMPUTATION OF THE FOREARM.

The wisest maxim, with respect to the place for making the incision, is to cut off as little of the limb as possible. The forearm is to be held by two assistants, one of whom is to take hold of the elbow, the other of the wrist. The tourniquet is to be applied to the lower part of the arm, and the assistant, holding the elbow, should draw up the integuments, so as to make them tense. The circular incision is then to be made down to the fascia; from this as much skin is to be detached, reflected, and saved, as is necessary for covering the ends of the bones, and the muscles are to be cut on a level with the reflected skin, at the same time directing the knife obliquely upward. As many of them are deeply situated between the two bones of the forearm, too much attention cannot be paid to dividing all of them, with a double-edged knife introduced between the radius and ulna.

The soft parts are to be protected from the saw by a linen retractor. It is generally recommended to saw the two bones together, for which purpose the forearm should be placed in the utmost state of pronation. In any other position, the ulna is situated almost directly under the radius.

The ulnar, radial, and two interosseous arteries, are those, which usually require a ligature.

AMPUTATION AT THE HIP-JOINT.

The French Academy of Surgery proposed the following question in 1756, as the grand prize subject: *In the case, in which amputation of the hip-joint should appear to be the only resource for saving the patient's life, to determine whether this operation ought to be practised, and what would be the best way of performing it?* No satisfactory memoirs having been presented, the same subject was proposed in 1759. The approbation of the academy was now conferred on a paper, in which the possibility of amputation at the hip-joint was established. The cases, demanding the operation, are also determined by Barbet, the author. If, for instance, a cannon ball, or any other violently contusing cause, should have carried off or crushed the thigh, so as only to leave a few parts to be cut to make the separation complete, we ought not to hesitate about doing it. A sphacelus, extending to the circumference of the joint, and destroying the

greatest part of the surrounding flesh, might render the operation equally necessary and easy. (See *Sabatier, Tom. 3, p. 271, &c.*) Cases are adduced of the limb being taken off, by the surgeon completing the separation of the dead parts with a knife. However, this cannot be considered as amputation at the hip-joint. Dividing a few dead fibres was a thing of no importance, in regard to the likelihood of its creating any bad symptoms. The proceeding, in fact, seems to me to have no analogy at all to the bloody operation of taking the thigh bone out of the socket. I cannot conceive any case, in which the circumstances, however perilous, would be at all improved by this operation. The following are Mr. Pott's sentiments: "M. Bilguer, and M. Tissot, are the only people whom I have met with, or heard of, in the profession, who speak of an amputation in the joint of the hip, as an advisable thing, or as being preferable to the same operation in the thigh." After a quotation or two, he continues; "that amputation in the joint of the hip is not an impracticable operation (although it be a dreadful one) I very well know. I cannot say, that I have ever done it, but I have seen it done, and am now very sure I shall never do it, unless it be on a dead body. The parallel, which is drawn between this operation and that in the shoulder will not hold. In the latter it sometimes happens, that the caries is confined to the head of the os humeri, and that the scapula is perfectly sound and unaffected. In the case of a carious hip-joint, this never is the fact; the acetabulum ischii, and parts about, are always, more or less in the same state, or at least in a distempered one, and so indeed most frequently are the parts within the pelvis, a circumstance this of the greatest consequence; for the power of performing the operation beyond the seat of the disease, and, consequently, of totally removing all the distempered parts, is the very decisive circumstance in favour of amputation every where, but, in the hip, where (to say nothing of the horridness of the operation itself) the hemorrhage, from a multiplicity of vessels, some of which are of considerable size, and the immense discharge which a sore of such dimensions must furnish, the distempered state of the parts, which cannot by the operation be removed, will render it ineffectual, bold and bloody as it must be." (*Pott on Amputation.*)

This dreadful operation was performed in this country, some years ago, by Dr. Kerr, of Northampton. (See *Immacin's Med. Commentaries, Vol. 6, p. 337.*) M. Larrey informs us, that he has performed

it three times; twice in Egypt, and once, while he was surgeon to the French army on the Rhine. One of his patients survived the operation a week, at the end of which he was carried off by the plague; and the others died, after being conveyed, in a very uneasy manner, during a precipitate march of the army. (See *Relation de l'Expédition de l'Armée d'Orient en Egypte, &c.*) For my own part, with all the respect, which I entertain for this judicious surgeon, I cannot conceive any circumstances, in which a patient would be benefited by so severe an operation. Were the upper portion of the thigh bone the only part diseased, or were it and the adjacent part of the pelvis splintered by a gun-shot injury, I should rather listen to the suggestion of Mr. Charles White, of Manchester, and endeavour to perform the excision of the diseased, or splintered parts, than have recourse to amputation at the hip, an operation, however, which, as we have seen, has the sanction of authority.

[Military surgery has undergone, within a few years, great alterations. Innovation has, in some instances, been followed by real and important improvements; but whether in the full extent supposed by its advocates, admits of a doubt. Amputation at the hip joint, is an operation on which a surgeon can never reflect without horror; but I am not prepared to say with Mr. Cooper, that "I cannot conceive any circumstances in which a patient would be benefited" by it.

The following extracts from a new work on gun-shot wounds, by Mr. Guthrie, will shew, that the military surgeons continue, occasionally, to perform it.

"I have not much to offer from actual experience of the operation, having performed it but once unsuccessfully. I have however seen many cases in which it ought to have been attempted, and which died. I have seen many in which the operation would have been necessary, if the constitution of the patients could ever have recovered the shock it had received at the moment of injury. I know that many cases have died after long continued disease of the thigh bone from gun-shot wounds, that would have had a chance of recovery, if the operation had been performed; and I have several times amputated so close to the trochanters, that I could with ease have removed the head of the bone without any increase of the external incisions.

This amputation is of course either primary or secondary; but the nature of the injury or disease differs very much in these two stages; for very few, or none of the cases that render its performance

necessary on the field of battle, ever live to the period when secondary amputation is usually recommended.

Wounds demanding amputation of the hip joint on the field of battle, arise from cannon or grape shot, or the explosion of shells. Few surgeons would think of performing it for a wound by a musket ball, although cases may occur that require it, and the principal one that will render it necessary, will be a fracture of the head or neck of the bone, with a wound of the great vessels, or some other arterial trunk causing hæmorrhage, and stuffing the thigh with blood. A grape or small cannon shot, may strike the fore part of the thigh, and without wounding the inguinal artery itself, may, in its passage to the neck of the femur, wound some large arterial branches, causing considerable hæmorrhage: the wound shall not be large, and yet the chance of saving the life of the patient will be but very small indeed. I recollect two cases of this kind in particular; one after the battle of Vimiera, by a cannon shot, which proved fatal on the second day after the injury, no one at that time thinking of the amputation at the hip joint. The other occurred at Salamanca, by a large ball, which shattered the neck of the femur and the body of the bone below. I did not see this person for near forty-eight hours after the injury, but was informed that on his first presentation for assistance, an artery, supposed to be a large branch of the femoral, had thrown out its blood per saltum, and was stopped by pressing some lint on the wound. The limb soon swelled to nearly twice its natural size, with much external inflammation. The patient himself thought his case desperate, as did every one about him, and declared his willingness to submit to any operation that might be proposed; but the time for operating was past, even if any operation could have been agreed upon.

After two months of severe suffering, in which there were even some prospects of life being preserved, this man died. The latter period of the time was passed, however, without any hope of recovery, and surgical aid was given merely with the view of rendering his last moments as easy as possible. The great strength of constitution shewed by this man during the whole course of his illness, and his great endurance of suffering, have always inclined me to think the operation at the hip joint would have succeeded, if it had been performed shortly after the receipt of the injury.

A shell bursting near a soldier may drive a large piece of an inch in thick-

ness, and a pound or two in weight, into the inner part of the thigh, without wounding the femoral artery, yet fracturing the head of the bone: here several large vessels, and perhaps the great sciatic nerve would be divided, and the only chance of life, in my mind, would be in the immediate removal of the whole. I saw a fatal case of this kind during the siege of Ciudad Rodrigo, where the patient lived long enough to shew the necessity of performing this operation.

A piece of a shell may strike between the trochanter and the ilium, go through the neck of the bone, and tear its way out below the tuberosity of the ischium, destroying all the parts in its course, without either killing the soldier by hæmorrhage, or by the shock of the blow to the constitution. This accident happened to a man of the 40th Regiment, at the battle of Salamanca, about four o'clock in the afternoon. He was in a good state to undergo the operation when I saw him next morning, but none of the surgeons present with me would agree to it; all allowed nothing could save the man; but the opinion entertained of the cruelty of the operation, and of its certain failure prevented its being done. I took this man into Salamanca with me, and his appearance for six successive days before he died, made me reproach myself for my want of courage, in not contemning any remarks that might be made, on my having undertaken it in opposition to the opinion of my colleagues; and I declined it, not because the general opinion was against it, but in consequence of the bad success of one, and of the good success of the other, of the two next cases to be related.

When a cannon-shot carries away the thigh above its middle, so as to exclude the more common flap operation close to the trochanter, it is almost always fatal. These accidents generally destroy at once. On the field of battle, I have seen many, having searched particularly for them, but have found them dead, or beyond the reach of surgical aid.

I have seen a case of a cannon-shot striking the outside of the thigh, tearing away the trochanter and surrounding parts, without wounding the femoral artery, or any great vessel that would cause any serious hæmorrhage, or so great a shock to the constitution as to render the operation impracticable; yet this man died without any attempt being made for his relief, which was neither good surgery or humanity.

When the femoral artery has been torn through by a cannon-shot there is, at the moment, a great loss of blood, but the

patient does not bleed to death, neither does he appear to die ultimately from the effects of the hæmorrhage; for I have seen several men lose a greater quantity from the same vessel without any such effect, but from the shock to the constitution; and this observable in many cases of amputation of the thigh, where there has been little loss of blood; and yet the patient dies, during, or immediately after the operation. A considerable hæmorrhage, on the other hand, renders a patient less able to bear an operation than he otherwise would do, and where there has been much and sudden bleeding, the powers of life are so exhausted as not to be able to bear any further disturbance. This effect is most frequently caused by wounds of the femoral artery, and where it has occurred, the chance of success from the operation, will be very small: and the combination of injury arising from the loss of blood, and the shock of the blow, will have so much diminished the powers of life, that the operation in addition, will destroy the remainder.

If (as I have seen in many instances) the bones of the pelvis are injured, in any of the preceding kinds of accident, the result will be fatal, and the operation should not be performed; but some little destruction of the soft parts, should not prevent it, if the patient be otherwise in a favourable state.

A very extensive injury of the soft parts of the thigh, if the bone be not broken, and the femoral artery not divided, does not authorize the operation, although the artery be laid bare for three or four inches of its course.

An officer of the 88th Regiment, was wounded in the trenches; at the siege of Ciudad Rodrigo, by a twenty-four pound shot, which struck the outside of the anterior part of the left thigh, and carried away the fore part of it from the groin to within a hand's breadth of the knee; the femoral artery lay bare at the bottom of the upper part of the wound, and was seen pulsating for near three inches; the sartorius and rectus muscles were carried away, and all the muscles on the outer and inner side of the thigh more or less mangled by the shot, or torn by the laceration; it was altogether the most frightful looking wound I had seen, not even excepting where the limb has been completely torn off. Having the superintendence of the 3d and 4th divisions of infantry, the greater part of the medical officers of both were with me at the time; and on this officer's being brought to our field hospital in the rear of the trenches, they all, without an exception, declared he must shortly die, if the limb was not

removed. In compliance with this opinion, I proposed to tie the artery below Poupart's ligament, and to endeavour to save flaps to cover the great trochanter, the bone being sawed off below, as I have since done in several instances; and if this was not practicable, the head of the femur was to be removed. On placing him on the panners for the purpose of operating, he was so exceedingly faint, the pulse at the wrist being scarcely perceptible, that I conceived the operation would be useless, as he would certainly die under our hands. He was removed to a corner of the hospital, and placed on a hay mat amongst other cases of wounded supposed in a dying state, a little lint being laid over this enormous surface. By the next morning he had much recovered, and as his thigh became very painful, he was desired by the surgeon of the division arriving in succession, to wet it with warm water; this was done, but his countenance was so ghastly that he was considered by every one as dying; indeed his regiment actually returned him dead, and his commission was filled up in England. In this state he remained till the day after the storming of Ciudad Rodrigo, when, from the advance of Marshal Marmont, the wounded were sent across the Agueda. Desirous of knowing whether any stragglers of the corps I belonged to might still be at the field hospital, I rode to it on leaving the town, and found every one gone except this poor gentleman, who requested my assistance; having conveyance in the town, I offered to take him to my divisional hospital, five leagues distant, where all the other wounded had been conveyed, which offer he gladly accepted, and reached the village of Aldea del Obispo, with less inconvenience than I expected; I daily feared the femoral artery would give way, but nothing of the kind occurred, the slough from the whole surface of the wound soon separated, and there was much less of it than is usual on such occasions, but this may be attributed in some measure to the attention paid him, and to the extreme coldness of the weather in a room without a fire-place. The discharge of pus was very great, and the artery lay in a channel completely covered by it;—I hourly expected it would ulcerate, but granulations soon began to shoot out, and by the end of three weeks the artery was covered in, although its pulsations were still visible at a distance; the sore gradually contracted in a surprising degree, and in two months it was diminished to half its original size, very little new skin having been formed. At this

period he left me on his way to the rear, on the army moving down to the siege of Badajos. The attention paid to this officer in regard to diet, attendance, and surgical aid, was very great; more, indeed, than he could have received under any other circumstances. His recovery was considered so unlikely, that no one looked at his wound after the first day; all supposed him past relief, as was really the case with an officer of Engineers, lying beside him, whose arm was shattered to pieces by a shell, and the os ilium bared on the outside of the glutæi muscles, and on the inside of the iliacus internus, as if it had been for some time in maceration. The insertions of the external and internal oblique, and the transversalis muscles were torn out without the peritoneum being opened, which alone prevented the intestines from coming out at the wound.

Although this gentleman's life was saved, still, I am of opinion, that very few would have recovered under the same injury.

The secondary operation has seldom, I believe, been performed during the high suppurative stage succeeding to injury from gun-shot wounds; and as I do not believe it can be successful, if done at this period, I would not perform it after the second day, until the third or fourth week. There are not many cases that will demand it at this period, as the femur, in most compound fractures of the thigh, can in general be sawed off, at, or immediately below the little trochanter."

The operation has been twice performed in England: in one case it was completely successful; and in the other, the patient lived thirty days.

"Mr. Brownrigg, Surgeon to the Forces, has performed the operation four or five times: on one occasion the patient lived eight days, and died from fever, supposed to arise from causes foreign to the operation.

In the last case he was completely successful. The man received a gun-shot wound in the thigh, which fractured the bone close to the trochanter, on the 29th Dec. 1811, near Merida, in Spain. On the 12th of December, 1812, the operation was performed, and the man is now living at Spalding, in Lincolnshire, in perfect health.

Mr. Brownrigg intends, I believe, to publish the particulars of this case. I have also been informed, that the operation has been performed in the West Indies.

These cases prove, that the operation is not only necessary, but practicable,

and that it may be effected with success under certain circumstances. This being granted, it necessarily follows that the operation ought to be recommended and performed in every case in which it can alone bring relief, or offer a prospect of success. No man should, therefore, be allowed to die without its being proposed to him; and if it be a case for primary operation, the sooner it is done on the field of battle, consistent with propriety, the greater will be the chance of success, for the patient cannot live to the period for secondary amputation. It is in this, and other operations high in the thigh, that the question of time is most important, for haste is as injurious as delay, when improperly applied.

If the patient has suffered much loss of blood, or is in a state of syncope, or nearly approaching to it, unable to articulate, with a pulse scarcely perceptible, and the skin clammy and cold, an immediate operation would only hasten his death; but if excited by stimulants and cordials, he will have some chance of recovering himself in an hour or two, so as to undergo the operation with a better prospect of success, or he will in that period sink and die. If, on the contrary, he is brought to the surgeon, although much alarmed and reduced by the sudden shock and loss of blood, with strong sensations of pain, expressed by his cries for assistance, convulsive motions of the limb and body, and the powers of the sensorium not destroyed, the operation should be performed immediately; or, instead of becoming more calm and collected, he will gradually sink into the state of the first described, and be unable to bear the operation. On the other hand, the first mentioned, if he be excitable, will in time rather approach to the state of the latter, and from the pain, &c. he suffers, will call for the performance of the operation. This violent nervous commotion, however, is not common; it depends upon particular idiosyncrasies, and will never in the first be so excessive as in the last.

The operations being decided upon, it is, I confess, not like that at the shoulder-joint, to be done by every one of moderate ability. No surgeon should attempt it, unless he is conscious of possessing great coolness, a presence of mind equal to any emergency, and a correct knowledge of the parts to be divided.

I consider the operation to be best performed in the following manner. The patient should be laid on a low table, or two field panniers placed together, covered with a folded blanket to prevent the edges giving pain, and properly sup-

ported in a horizontal position. An assistant leaning over, and standing on the outside, should compress the artery against the brim of the pelvis, with a firm, hard compress of linen; such as is usually used before the tourniquet; he should also be able to do it with his thumb, behind the compress, if it be found insufficient. The surgeon standing on the inside, with a strong pointed amputating knife of a middle size, with the back curved, makes his first incision through the skin, cellular membrane, and fascia, so as to mark out the flaps on each side, commencing about four finger's breadth, and in a direct line below the anterior superior spinous process of the ileum in a well-sized man; and continuing it round in a slanting direction at an almost equal distance from the tuberosity of the ischium, nearly opposite to the place where the incision commenced. Bringing the knife to the outside of the thigh, he connects the point of the incision where he left off with the place of commencement, by a gently curved line, by which means the outer incision is not in extent more than one third of the size of the internal one. The integuments having retracted, the glutæus maximus is to be cut from its insertion in the linea aspera, and the tendons of the glutæus medius and minimus from the top of the trochanter major. The surgeon now placing the flat edge of the knife on the line of the retracted muscles of the first incision, cuts steadily through the whole of the muscles, blood-vessels, &c. on the inside of the thigh. The artery and vein, or two arteries and vein, if the profunda is given off high up, are to be taken between the fingers and thumb of the left hand, until the surgeon can draw each vessel out with the tenaculum, and place a ligature upon it. Whilst this is doing, the assistants should press with their fingers on any small vessels that bleed. The surgeon then cuts through the small muscles running to be inserted between the trochanters, and those on the under part of the thigh, not yet divided; and with a large scalpel opens into the capsular ligament, the bone being strongly moved outwards, by which its round head puts the ligament on the stretch. Having extensively divided it on the fore and inside, the ligamentum teres comes into view, and may readily be cut through. The head of the bone is now easily dislocated, and two or three strokes of the knife separates any attachment the thigh may still have to the pelvis. The vessels are now carefully to be secured. The capsular ligament, and as much of the ligamentous

edge of the acetabulum may be removed as can readily be taken away. The nerves, if long, are to be cut short, the wound well sponged with cold water, and the integuments brought together in a line from the spinous process of the ilium, to the tuberosity of the ischium. Three sutures will in general be required, in addition to the straps of adhesive plaster, to keep the parts together; the ligatures are to be brought out in a direct line between the sutures, a little lint and compresses are to be placed over the wound, and on the under flap, to keep it in contact with the cotyloid cavity, and assist the union of the parts. A piece of fine linen is to be laid over them, and the whole retained by a calico bandage put round the waist, and brought over the stump.

It is recommended to pare the bone of its cartilage; and if this could be readily done, I would willingly agree to it, but the cartilaginous surface of the acetabulum is not to be cut away without much difficulty and some time, which cannot be spared; for I consider the success of the operation to depend very much upon the quickness with which it is performed, not on account of hæmorrhage, but to avoid the shock the constitution receives from the continued exposure and irritation of so large a surface in the immediate vicinity of the trunk of the body. It is proved by experience to be unnecessary at the shoulder joint; and will, I think, be found equally so at the hip joint.

When I wrote these observations, and shewed the method of performing the operation in the Peninsula, I thought I was the first to recommend that the artery should not be tied previous to commencing the operation. M. Baffos, however, has the priority in practising it, which I readily grant to him, and am gratified in having his authority to adduce in support of the measure.

Union by the first intention is to be wished for in a great degree, as lessening the surface of the wound; but as all the parts beneath the skin cannot unite, and especially about the acetabulum and the inside of the glutæus muscle, it is not advisable to let the skin adhere on the middle and lower part of the stump; for as the parts deep-seated must suppurate and granulate, a fair opening for the discharge should be preserved, and collections of matter in any part should be carefully guarded against by gentle pressure, compress, and bandage.

The after treatment will be the same as in other cases of amputation: the shock, however, of the injury and the amputation will be so great, that the antiphlogistic

regimen to the extent of blood-letting will not be necessary. If the patient be very low, cordials in small quantities, with opiates, should be given, and a light nourishing diet. If inflammatory symptoms come on, the appropriate remedies formerly recommended must be employed without delay. If there be heat or uneasiness in the wound, it must be kept wet with cold water.

If the surgeon called upon to perform this operation, has not been in the habit of dealing with large arteries, he may feel an unconquerable repugnance to cutting through the femoral artery before it has been tied; and although I can most positively assure these gentlemen, there is nothing to fear in doing it, still they may tie the artery first, if they cannot overcome this feeling of danger. It is to be done by cutting through the integuments in the usual manner, and then dissecting for the artery and vein, previous to cutting through the muscles.

AMPUTATION AT THE SHOULDER JOINT.

The first description of this is to be found in *Le Dran's Observations*. His father, it seems, undertook the operation, in a case of caries conjoined with exostosis, which affection reached from the middle to the neck of the humerus. He began with rendering himself master of the bleeding, by introducing a straight needle, armed with a strong ligature, doubled several times. This was passed from the front to the back part of the arm, as closely to the axilla and bone as possible. The ligature, including the vessels, the flesh surrounding them, and the skin covering them, was tightened over a compress. Then Le Dran, with a straight narrow knife made a transverse incision through the skin and deltoid muscle down to the joint, and through the ligament surrounding the head of the humerus. An assistant raised the arm, and dislocated the head of the bone from the cavity of the scapula. This allowed the knife to be passed with ease between the bone and the flesh. Le Dran then introduced the knife downward, keeping its edge continually somewhat inclined towards the bone. In this manner, he gradually cut through all the parts, as far as a little below the ligature. As there was a large flap, Le Dran made a second ligature with a curved needle, which ligature included a great deal of flesh, the redundant portion of which was cut off together with the first ligature, which had become useless. The cure was completed in about ten weeks. Le Dran (the son) does not state, that the operation was a

new one, and it appears, from the *Récherches Critiques sur l'origine, &c. de la Chirurgie en France*, and from La Faye's notes on Dion's, that it had been previously practised by Morand the father.

Garengot thought a curved needle, with sharp edges, would be better for making the first ligature, and that the wound need not be so large, if the incision were to begin two or three finger-breadths from the acromion, and made so as to form two flaps, the lower one of which would correspond to the axilla, and might be brought into contact with the other, after the second ligature was applied.

La Faye extended the improvements further. After placing the patient in a chair, and bringing the arm into a horizontal position, he made, with a common bistoury a transverse incision into the deltoid muscle down to the bone, four finger-breadths below the acromion. Two other incisions, one in front, the other behind, descended perpendicularly to this first, and made a large flap of the figure of a trapezium, which was detached and turned up towards the top of the shoulder. The two heads of the biceps, the tendons of the supra-spinatus, infra-spinatus, teres minor and subscapularis, and the capsular ligament, were next divided. The head of the humerus could now be easily dislocated, when the assistant, who held the lower part of the limb, made the bone describe the motion of a lever upward. La Faye next carried his incisions downward, along the inner part of the arm, until he was able to feel the vessels, which he tied as near the axilla as possible. Then he completed the separation of the limb, one finger-breadth lower down. All remaining to be done, was to bring down the flap over the glenoid cavity, and dress the wound. (See *Nouvelle Méthode pour faire l'Opération de l'Amputation dans l'articulation du Bras avec l'Omoplate, par M. La Faye, in Mém. de l'Acad. de Chirurgie, Tom. 5, p. 195, Edit. in 12mo.*)

The advantages of this plan are obvious. As only one ligature is applied, the patient is saved a great deal of pain; the flap, which is connected with the acromion, is more easily applied and kept on the stump, than the one, which Garengot recommended to be made, at the lower part of the axilla. Lastly, any discharge can readily find vent downward.

Mr. Samuel Sharp recommended the following plan. "The patient's arm being held horizontally, made an incision through the membrana adiposa, from the upper part of the shoulder across the pectoral muscle, down to the arm-pit, then turning the knife with its edge upwards,

divide that muscle and part of the deltoid, all which may be done without danger of wounding the great vessels, which will become exposed by these openings. If they be not, cut still more of the deltoid muscle, and carry the arm backward. Then with a strong ligature, having tied the artery and vein, pursue the circular incision through the joint, and carefully divide the vessels at a considerable distance below the ligature; the other small vessels are to be stopped, as in other cases.

"In doing this operation, regard should be had to the saving as much skin as possible, and to the situation of the processus acromion, which, projecting considerably beyond the joint, an unwary operator would be apt to cut upon." (*Operations of Surgery.*)

Bromfield's plan consisted in first exposing the axillary vessels, by dividing the integuments in the axilla. These vessels he detached, and tied. Then having cut the capsular ligament with scissors, he finished the operation on Mr. Sharp's plan.

At length, P. H. Dahl, in 1760, published at Goettingen, a Latin dissertation on amputation at the shoulder, in which publication he proposes making one's self master of the blood, before the operation, by a tourniquet, the pad of which pressed on the subclavian artery under the clavicle. This enabled the operator to dispense with tying the vessels in the first instance. Camper had observed, that if we push the scapula backward, and press the axillary artery with the finger between the clavicle, coracoid process, and great pectoral muscle, the pulse at the wrist instantly stops.

Dahl's tourniquet was obviously constructed, in consequence of what Camper had observed, and it consists of a curved, elastic plate of steel, the length of which may be readily imagined. A pad is attached to the shortest end of this plate, and is made capable of projecting further by means of a screw. The instrument is applied by making it embrace the shoulder from behind forward, while the pad presses on the hollow under the clavicle, between the margins of the deltoid and pectoral muscles. The long extremity of the steel plate, which descends behind the shoulder, is to be fixed to the body by a sort of belt. The pad is then to be depressed, until the pulsation of the axillary artery is stopped.

Further experiments have proved, however, that this tourniquet may be dispensed with, and the flow of blood in the axillary artery commanded, by properly compressing this vessel with a pad, at the

place where it emerges from between the scaleni muscles, above the middle part of the clavicle. Thus the artery becomes pressed between the pad and the first rib, across which it runs. This method, which is as simple as possible, is preferable to that, which requires a tourniquet that is so seldom at hand.

Amputation at the shoulder has been in some degree superseded by a preferable operation, even in cases in which it would formerly have been deemed quite indispensable, such as considerable gun-shot fractures of the head of the humerus; a caries of the substance of this part, &c. Boucher, in *Tom. 2, Mem. de l'Acad. de Chir.* shews, that considerable wounds, extending into the shoulder joint, were capable of being successfully treated, by extracting the pieces of bone, which had been separated by violence. Instances are also recorded, in which, when the head and neck of the humerus had been totally disunited from the body of that bone, a cure was accomplished by making such incisions as allowed the portions of bone, now become extraneous bodies, to be taken away. Mr. White, of Manchester, proceeded further, and ventured to make a deep incision at the upper part of the arm, to dislocate the head of the humerus, which he knew was carious, and, pushing it through the wound, took it off with a saw.

"Edmund Pollit, of Sterling, near Cockey-Moor, in this county, (Lancashire) aged fourteen, of a scrofulous habit of body, was admitted into the Manchester Infirmary, April 6, 1768. The account I received with him was, that he had been suddenly seized, about a fortnight before, with a violent inflammation in his left shoulder, which threatened a mortification, but at last terminated in a large abscess, which was opened with a lancet a few days before his admission. The orifice was situated near the axilla, upon the lower edge of the pectoralis major, and through it I could distinctly feel the head of the os humeri, totally divested of its bursal ligament. The matter, which was very offensive, and in great quantity, had made its way down to the middle of the humerus, and had likewise burst out at another orifice, just below the processus acromion, through which the head of the os humeri might easily be seen. The whole arm and hand were swelled to twice their natural size, and were intirely useless to him. He suffered much pain, and the absorption of the matter had brought on hectic symptoms, such as night sweats, diarrhœa, quick pulse, and loss of appetite, which had extremely emaciated him.

"In these very dangerous circumstances there seemed to be no resource but from an operation. The common one in these cases, that of taking off the arm at the articulation, with the scapula, appeared dreadful, both in the first instance, and in its consequences. I therefore proposed the following operation, from which I expected many advantages, and performed it on the fourteenth of the same month. I began my incision at that orifice which was situated just below the processus acromion, and carried it down to the middle of the humerus, by which all the subjacent bone was brought into view. I then took hold of the patient's elbow, and easily forced the upper head of the humerus out of its socket, and brought it so entirely out of the wound, that I readily grasped the whole head in my left hand, and held it there till I had sawn it off, with a common amputation saw, having first applied a pasteboard card betwixt the bone and the skin. I had taken the precaution of placing an assistant, on whom I could depend, with a compress just above the clavicle, to stop the circulation in the artery, if I should have the misfortune to cut or lacerate it, but no accident of any kind happened, and the patient did not lose more than two ounces of blood, only a small artery which partly surrounds the joint being wounded, which was easily secured.

"He was remarkably easy after the operation, and rested well that night; the discharge diminished every day, the swelling gradually abated, his appetite returned, and all his hectic symptoms vanished. In about five or six weeks I perceived the part from which the bone had been taken, had acquired a considerable degree of firmness, and he was able to lift a pretty large weight in his hand. At the end of two months I found that a large piece of the whole substance of the bone that had been denuded by the matter, and afterwards exposed to the air, was now ready to separate from the sound, and with a pair of forceps I easily removed it. After this exfoliation the wound healed very fast, and on August 15, he was discharged perfectly cured. On comparing this arm with the other, it is not quite an inch shorter; he has the perfect use of it, and can not only elevate his arm to any height, but can likewise perform the rotatory motion as well as ever. The figure of the arm is no ways altered, and from the use he has of it, and its appearance to the eye and to the touch, I think I may safely say the head, neck, and part of the body of the os humeri are actually regenerated.

"I did not make use of any splints, machine, or bandage, during the cure, to

confine the limb strictly in one certain situation, nor was his arm ever dressed in bed, but sitting in a chair, and as soon as he could bear it, standing up with his body leaning forwards, to give room for the application of the bandages, which were no more than what was just necessary to retain the dressings; and to this method I attribute the preservation of the motion of the joint, which could not have been so well effected any other way, as the joint would in all probability have remained stiff, and formed an ankylosis, if it had not been allowed to play about.

"Though from this operation I hoped for many advantages preferable to the amputation of the limb at the scapula, yet my most sanguine expectations fell greatly short of the success attending it. I did not flatter myself with the hopes of a moveable joint, or that the length of the limb would be so nearly preserved, where there was a loss of above four inches of the whole substance of the bone, without any other bone to support it, as in the leg and forearm, and where the dreadful condition of the arm, at the time of the operation, prevented me from making use of any machine to keep it extended.* But I suppose the weight of the arm was in this case in some measure sufficient to counterbalance the contractile power of the muscles, as his arm was only suspended by a common sling, and the patient not at all confined to his bed. I could not help being surprised to find so much strength and firmness, as evidently shewed a regeneration of the bone, before the lower part had exfoliated, or even before it had begun to loosen. The osseous matter could not proceed from the scapula, the glenoid cavity of that bone not being divested of its cartilage, could it then possibly escape from the end of the sound bone, before the morbid part had begun to separate from it? Or are there any vessels that could convey the bony matter, and deposit it in the place of what had been removed †

* After the extraction of three inches and ten lines of the os humeri, M. Le Cat made use of a machine to keep the upper and lower pieces of the bone at their proper distances. He has given a description of the case, and a figure of the machine in vol. 56 of the *Philos. Trans.* p. 270.

† Mr. Gooch, in his volume of cases and practical remarks, relating the case of a compound fracture of the leg, where a very considerable portion of the tibia was sawn off, says, "In about three weeks I was sensible, as were also several surgeons, whom curiosity led to see so un-

"These are points that I will not pretend to decide absolutely, but I am much inclined to the latter opinion. Is it not probable that there was a regeneration of the cartilage as well as of the bone? It is well known to every body conversant in anatomy, that not only the ends of some bones, which are joined to no others, are covered with cartilages, but that they are never wanting on the ends, and in the jointed cavities of such bones as are designed for motion, and I cannot see in this case how the motion could be preserved so complete without a cartilage; and indeed without a bursal ligament, or something analogous to it, to contain the synovia, and keep the bone in its place.

"As this is the first operation of the kind that has been performed, or at least made public, I thought the relation of it might possibly conduce to the improvement of the art. That ingenious surgeon, Mr. Gooch, has indeed related three instances of the heads of bones being sawn off in compound luxations. In one of these cases the lower heads of the tibia and fibula were sawn off, and in another that of the radius, and in the third that of the second bone of the thumb, but these were in many respects different from the present case. I believe it will seldom happen that this operation will not be greatly preferable to the amputation of the arm at the scapula, as this last is generally performed for a caries of the upper head of the os humeri, and as the preservation of a limb is always of the utmost consequence, and what every surgeon of the least humanity would at all times wish for, but particularly where, as in this case, the whole limb, and its actions, are preserved entire, the cure no ways protracted, and the danger of the operation most undoubtedly less. For though amputation is often indispensably neces-

common a case, that the substance which grew in the space of five inches entirely void of bone, had acquired in the middle only a greater degree of solidity than flesh, which circumstance not agreeing with the generally received notion of the generation of callus, we proved, beyond dispute, with a sharp pointed instrument; and we observed that the ossification was gradually formed from that central point, which was considerably advanced before any exfoliation was cast off the ends of the divided bone. In less than four months the whole space was so well supplied with the callus, or rather new bone, that he was able to raise his leg, when the bandage was off, without its bending." (*Cases and Remarks, new edit. p. 287.*)

sary, and frequently attended with little danger or inconvenience when only part of a limb is removed, yet where the whole is lost, the danger is greatly increased, and the loss irreparable.

"I had frequently performed this operation upon dead subjects, and where the parts had not been diseased, and never found any difficulty; and from a dissection of the parts had no reason to doubt of success in a living subject, where the ligaments and muscles are more supple, and the matter, by insinuating itself betwixt the bone and integuments, has made less dissection necessary. I have likewise, in a dead subject, made an incision on the external side of the hip joint, and continued it down below the great trochanter, when, cutting through the bursal ligament, and bringing the knee inwards, the upper head of the os femoris hath been forced out of its socket, and easily sawn off; and I have no doubt but this operation might be performed upon a living subject with great prospect of success.

"The Royal Academy of Surgery at Paris, proposed for a prize question, whether amputation of the thigh, at its articulation with the os innominatum, was ever advisable; but, was I under a necessity of performing this operation, or that which I have been describing, I should not hesitate a moment which to prefer.

"I had the honour of shewing to the Royal Society the bones which were taken from the boy's arm, at the time this paper was read, and they are now deposited in their museum." (*Cases in Surgery, with Remarks by Charles White, F. R. S. p. 57.*)

Bent, of Newcastle, has inserted a similar case in the 64th Vol. of the Philosophical Transactions. White made only one incision, from the vicinity of the acromion down to the middle of the arm. Bent, not being able to get at the head of the bone, through the wound, which he had made from the clavicle to the attachment of the pectoral muscle, detached a portion of the deltoid, where it is connected with the clavicle, and another part, where it is adherent to the humerus. Sabatier has proposed making two cuts at the upper part of the arm, which meet below like the letter V, extirpating the flap, dividing the inner head of the biceps, and capsular ligament; dislocating the head of the bone, and sawing it off. (*Médecine Opératoire. Tom. 3.*)

I think the cases, recorded by White and Bent, are truly important, inasmuch as they appear to have been the earliest models of a practice, which promises in a great measure to supersede all occasion for one of the most formidable and muti-

lating operations of surgery. To military and naval surgeons, these cases cannot fail to be highly interesting, as they must have frequent opportunities of availing themselves of the instruction, which they afford. M. Larrey, who was surgeon general to the French army in Egypt, employed the practice, with the greatest success, in cases of gunshot wounds. He thereby saved limbs, which, according to ordinary precepts and opinions, would have been a just ground for amputating at the shoulder; and, when we consider not only that a most dangerous operation is avoided, but that an upper extremity is saved, for which no substitute can be applied, we must allow, that the plan, first suggested and practised by Mr. White, cannot be too highly appreciated. When the arm is fractured near its upper extremity by a musket ball, it is considered by most surgeons necessary to amputate the limb, and, in such cases, the operation used invariably to be performed; but, says M. Larrey, "I have had the good fortune, on ten different occasions, to supersede the necessity for the operation, by the complete and immediate extraction of the head of the humerus, and of the splinters. I perform the operation in the following manner: I make an incision in the centre of the deltoid muscle, and parallel to its fibres, carrying the incision as low down as possible. I get the edges of the wound drawn asunder, in order to lay bare the articulation, of which the capsule is generally opened by the first incision, and by means of a probe pointed bistoury, I detach with the greatest ease from their insertions the tendons of the supra and infra spinati, of the teres minor, of the infra scapular, and of the long head of the biceps; then I disengage the head of the humerus, and remove it through the wound in the deltoid by means of my fingers, or of an elevator. I bring the humerus up to the shoulder, and fix it in a proper position by means of a sling and a bandage. Such is the operation which I performed on ten patients, in extirpating the head of the humerus; one of these died of the hospital fever, two of the scurvy, at Alexandria, and the fourth, after he was cured, died of the plague on our return to Syria. The rest returned to France in good health. The arm became ankylosed to the shoulder in some, and an artificial joint allowing of motion was formed in others."

[On the subject of amputation at the shoulder-joint, Mr. Guthrie has published some valuable remarks:—his diffuse style, however, precludes me from presenting them all to the American reader. The following are selected;

"This operation has until lately been considered of the utmost danger and importance, not only to the life of the person who is unfortunately the sufferer, but to the reputation of the surgeon who has the performance of it: many and various have therefore been the methods recommended for conducting it, all impressing on the mind of the operator the great extent of danger, and tending to disturb the steadiness of his judgment. Anatomy, which has thrown so much light on operative surgery in general, has not failed in the last few years to dispel the cloud that obscured this part of military surgery; and experience has proved it to be as simple, easy, and safe an operation, as any other of importance performed on the field of battle. The knowledge acquired from this source of its success, has given to military surgeons a confidence in performing it, that divests it of half its former terrors, and by removing from the mind of the patient the idea of his having suffered a hopeless operation, diminishes the subsequent danger, and most materially aids his recovery. The dread formerly entertained of this operation was very great, even by men of the best abilities; and under certain circumstances in domestic surgery, it may still be tedious. It can never however again be considered formidable in military surgery, except under bad management, and from extreme ignorance.

The distinction between the necessity of the operation, and the possibility of avoiding it, requires in many cases the exercise of the nicest judgment, and a due consideration of attending circumstances; for there is no part of military surgery, in which an operation can be performed with more advantage at the instant; or, delayed for a few days with a view of gaining information, with more prejudice; inasmuch as the necessary incisions are made in the first instance, in parts disposed to take on healthy actions, and in the best possible state for undergoing surgical operations. The constitution of the patient being also at that moment generally good, and able to sustain the demands upon it, under untoward circumstances; or of supporting, without future injury, the restraint and controul requisite for the successful accomplishment of the cure.

The difference between cutting in sound and diseased parts is justly appreciated by every surgeon, both as to his personal convenience and ease in operating, as well as to the future healing of the wound; and the advantage here is particularly great, as from the contiguity of the wound

to the chest and the principal organs of life, it is advisable to avoid any excess of action; and experience has demonstrated that the evil to be apprehended from the equilibrium of the circulation being destroyed, is infinitely less than it would be at a subsequent period of three or four weeks, after high suppurative action has been going on. In the latter, the operation is delayed until the parts to be divided have been long carrying on an increased action, and may even be diseased. The health and strength of the patient have been so much reduced, that he may be unable to support the additional pain and shock of the operation, which increase with the delay, or of giving that assistance requisite for the consolidation of the wound. Another and great consideration, is the ease and safety with which a person can be moved after the operation, compared with the danger and pain resulting from the disturbance of broken bones, the increase of inflammation, and other attendant evils under the same circumstances. It cannot be therefore too strongly impressed on the mind, that the necessary examinations should take place; and the operation be performed in those cases demanding it, as soon after the injury as possible, consistent with the state of the patient; and the surgeon should not satisfy himself with the idea of being able to accomplish it as safely, or as successfully, when suppuration has been established, and when perhaps he may have better assistance at hand; a kind of self-deceit that is occasionally permitted, but which cannot be too much reprobated.

The importance of the arm is so great, and even a limited use of it so valuable, that much should be hazarded to save it, when there is a tolerably fair prospect of success: the situation also and structure of the upper extremity, together with the command the surgeon has over it, and the less proportionate inconvenience resulting from a severe wound in that part to any other of equal value, renders its preservation after a serious injury, more practicable, and less dangerous than is frequently supposed. The operation should not therefore be performed, unless simple amputation by the flap operation cannot be successfully accomplished; or, where the limb is evidently destroyed, or, the injury seriously affecting the articulation itself, while the general health of the patient, or the unfortunate circumstances of situation, render the attempt at a further perseverance in saving the limb improper.

Injuries from musket-balls penetrating the capsular ligament, attended with fracture and destruction of the head and adja-

cent parts of the humerus, and wounding the axillary artery, require immediate operation.* A simple penetrating or incised wound of the joint, of small extent, does not call for any operation, as the patient, with due care, will escape with a certain degree of loss of motion, and of debility in the joint; nor is it proper in a wound from a musket-ball, where there is even some partial injury of the bone, as these cases frequently do well, and the patient preserves the use of the fore-arm.

Mr. Guthrie proceeds to state at great length, "accidents in the field," and "subsequent occurrences," which may demand the operation: for these the reader is referred to his work.—

It is now time to correct another misapprehension that the fear of hæmorrhage has introduced into this operation; I allude to the idea prevalent amongst many surgeons, that it is to be performed in a different manner from any other of importance; that instead of the calm, steady determination that distinguishes a surgeon of ability, who feels himself master of his subject, he is to forget or lay aside, what on all other occasions is considered most valuable, and endeavour to attain a peculiar precipitation and haste of manner, that is excluded from all other parts of surgery. There is still a practical point usually overlooked, that in military surgery there is little or no arm left to use as a lever in facilitating the operation, and that the separation of the head of the bone depends upon the surgeon, and not upon the assistants.

The patient should be placed on a seat lower than the surgeon; (in the field an hospital pannier is the best) and so supported that he may not be able to slide off during the operation, the assistant in charge of the tourniquet, or instrument described,† standing behind, and regulating the support, in such manner that he may always be able to make steady compression when required. The shattered arm or stump is then to be raised from the body, sufficiently to enable the hand of the operator to examine the axilla, and ascertain that his assistant can compress the artery when he pleases; for this simple motion of raising the arm to near a right angle with the body, to afford access to the axilla after the pressure is made, will frequently render some alteration of

it necessary. The arm should be also raised, so as to point out more clearly the insertion of the pectoralis major, and the posterior fold of the arm-pit; and as being more convenient to the operator, who, placing his finger on the lower end of the acromion process in the centre of the shoulder, (the hair in the axilla having been previously removed) with the smaller amputating knife commences his incision immediately below it, and with a gentle curve carries it downwards and inwards through the integuments only, a little below the anterior fold of the arm-pit, and which the raising of the arm readily points out. The second incision outwards, is made after the same manner, but something lower down, and is continued underneath, so as to shew the long head of the triceps at the under edge of the deltoid, without dividing any of the muscular fibres; by which means the skin has time and freedom to retract, which is a great object, being the part in general most wanted, and when retracted allows of subsequent extension. The third incision commencing at the same spot as the first, but following the margin of the retracted skin, divides the deltoid on that side to the bone, and exposes the insertion of the pectoralis major, which must be perfectly cut through, to shew the short head of the biceps flexor cubiti, and the coraco brachialis, which are then readily known by their longitudinal fibres, and the freedom the arm or stump receives from losing its attachment to the fore part of the chest: these two muscles however are not to be touched, although the flap thus formed is to be separated, and raised so as to expose the head of the bone, nearly as far as the coracoid process of the scapula. The fourth incision outwards, in the same manner divides the deltoid muscle down to the bone, and extending to the long head of the triceps, which it is not necessary to touch, as it would be afterwards divided: this flap is to be well turned back, so as to shew the insertions of the teres minor and infra spinatus, coming across horizontally from the scapula, to be inserted into the great tuberosity of the humerus; the posterior circumflex artery will be divided close to the bone, the anterior circumflex, and the continuation of the thoracica humeriana on the integuments of the arm, and some other small vessels may bleed, if the compression be not correctly applied; they ought not however to be tied, but merely stopped with the finger, and particularly the posterior circumflex, as this must again be divided, and pressure on the subclavian readily commands it; both the outer and inner flap being now raised, the

* General Scott of the United States army, happily recovered from such a wound and has a very useful arm.

† The handle of the common tourniquet covered with a linen bolster, is to be pressed by an assistant on the subclavian artery where it crosses the first rib.

head of the bone may be rolled a little outwards, and the *teres minor* and *infra spinatus* cut across upon it with a large scalpel, opening at the same time into the cavity of the joint; by which means the error of slitting up the bursa under the acromion, instead of the capsular ligament, will be avoided, and continuing the incision upwards, cutting through the capsular ligament, the tendon of the *supra spinatus*, and the long head of the *biceps flexor cubiti* as close as possible to the edge of the glenoid cavity. The surgeon placing his fingers on the head of the bone, cuts through the inner side of the capsular ligament, and with it the *subscapularis* muscle, going to be inserted into the lesser tuberosity of the humerus. The edge of the knife being constantly towards the bone, he divides the under part of the ligament, separating the head of the bone from the glenoid cavity: resuming ~~the~~ a small amputating knife, he cuts through the long head of the *triceps*, to prevent its hanging too much into the wound, and then with one sweep he connects the points of the two first incisions underneath, separating the arm from the body, dividing again the circumflex arteries above the first incision, the *teres major*, *latissimus dorsi*, *coraco brachialis*, long head of the *triceps*, axillary artery, veins, and nerves. This being the only dangerous step of the operation, the surgeon should inform himself if the artery be sufficiently compressed, which he will know by the posterior circumflex artery not bleeding, and the want of pulsation in the axilla: he should caution the assistant to preserve the steady position of the patient, and have another ready to press his closed hand upon the artery, if it should bleed. Laying down the knife, he takes the artery if bleeding between the finger and thumb; or if compressed pulls it out with a *tenaculum*, and ties it firmly with a small ligature of two good threads. The vessel is found contracted amongst the nerves in the lower third of the wound; all pressure being removed, the anterior and posterior circumflex arteries will bleed, and must be secured; or, if the artery subdivides high up, there may be a fourth large branch.

In recent cases of injury I have seldom had occasion to take up more than three arteries, and no cutaneous or other vessels, besides those divided by the last incision. The nerves, if hanging in the wound must be shortened, which though painful, prevents a source of irritation hereafter from their adhering in the neighbourhood of the cicatrix. The axillary vein, if it continue to bleed, should be secured with a single thread, as it allows some blood to

pass into the wound after it has been brought together, and, what is of more material consequence, permits it to pass into the loose cellular membrane surrounding the vessels down to the clavicle, which may cause considerable mischief, as the position of the patient is favourable to its gravitation.

All compression having been taken off the artery, the wound should be well cleansed, and here a little delay may be allowed. If the tendon of the long head of the *biceps flexor cubiti* be left long, it ought to be cut off with the scissors, as well as any ragged portions of the capsular ligament. The glenoid cavity need not be deprived of its cartilage. The *pectoralis major* will be observed to have retracted considerably, and to have doubled or folded in the skin covering it; through this (the parts being brought together,) a suture should be put to the opposite side, and the whole properly supported and compressed by strips of adhesive plaster and bandage, the ligatures being brought out direct. The incision then forms but one line from the acromion downwards, curving at the bottom to the fore part of the chest, the skin at the axilla being always a little wrinkled, and much inclined to retract. The flaps of the deltoid meet firmly, sink a little into the hollow under the acromion, lie close upon the glenoid cavity and the coracoid process; and from the pressure of the adhesive plaster and compress, with the evenness of the wound, the skin of this part nearly unites by the first intention; the hollow round the glenoid cavity is comparatively small to what might be expected, and the consolidation in healthy subjects, where every thing has done well, goes on steadily, so as not to leave any cause of future inconvenience. The surgeon, in all his dressings, should take care that no collection forms any where by keeping up a regular and proper compression in the course of the artery, the coracoid process, the *pectoralis major*, and the muscles from the scapula and back. The pain and sensation principally complained of is from the hand and arm; there is seldom any hæmorrhage, and the patient does not suffer more than in any other common amputation.

I have insisted on the arm being raised from the first, because in all operations that require the principal artery to be compressed, it should not be done until the limb be placed in the situation in which the operation is intended to be performed, as the mere alteration of posture removes the pressure from its destined point, as must frequently have been observed, when the tourniquet is applied.

without this caution in the axilla, or thigh. This elevation also allows more freedom to the knife in every direction, and points out more clearly the situation of parts. I beg, however, to be understood as not recommending the arm to be raised in secondary cases, when there is partial ankylosis, or thickening of the ligaments, or other fair obstacles to its being done with ease to the patient.

It is not necessary to lay bare the acromion, on the contrary, the finger should be placed immediately upon it, to insure the first incision, being near half an inch below it, if the eye of the operator be not a sufficient guide; the flaps turn aside sufficiently without it, the head of the humerus is extricated with equal ease, and there is no subsequent danger if the stump should slough, or of the acromion coming through and being a future inconvenience to the patient.

In making the last incision of separation, care should be taken to save as much of the integuments as the nature of the operation will permit; and this is done by keeping the head of the bone as far from the glenoid cavity as the attachment of the teres major and latissimus dorsi will allow, and by then cutting as close to the bone as possible. The long head of the triceps muscle is divided before the last incision, to prevent its hanging too long in the wound, and interfering with the approximation of the integuments. The anterior and posterior circumflex arteries

require only a single thread; the latter will be divided about three quarters of an inch from its origin, and the axillary artery in general near an inch, from where it gives off the subscapularis.

In giving an account of the success of some of my cotemporaries in the campaigns in the Peninsula, I must premise that the operation has become much more common among military surgeons than formerly; whether it be that its own utility has rendered it necessary, or that our surgeons are better operators, or that it has been occasionally performed without due discrimination, I cannot determine. Perhaps a combination of the whole of these circumstances may have been the cause of its multiplication; the latter, I am desirous of believing, to have little increased the number.

The following returns of the operation, as performed in the army under the Duke of Wellington, during a period of six months, from the 21st June to the 24th December 1814, may not perhaps be uninteresting. It includes the wounded at the battle of Vitoria, the destructive siege of St. Sebastian, and the battles of Pampeluna and the Pyrenees, and is another remarkable illustration of the necessity of operating on the field of battle, in preference to the delay of a secondary operation: the operations with the divisions of the army having been all primary, at the general hospitals, secondary.

General Hospitals.	Number of operations performed.	Died.	Cured, or out of danger.
Vitoria,	13	10	3
Bilboa,	5	5	0
Passages,	1	0	1
Total	19	15	4

Divisions of the Army.	Number of operations performed.	Died.	Cured.	Transferred, but considered out of danger.
1st,	3	0	2	1
2d,	1	0	1	0
3d,	1	0	1	0
5th,	12	0	12	0
6th,	1	1	0	0
Light,	1	0	0	1
Total	19	1	16	2

The 5th division performed the duties of the siege of St. Sebastian, and the men were principally wounded in the upper part of the body.

The loss with the divisions of the army was as one in nineteen in favour of the primary operation; a success truly astonishing. In the General Hospitals, under

surgeons equally able, the loss was fifteen in nineteen, a want of success as disheartening, as in the other encouraging; and arising from all the causes mentioned in the remarks on "Amputation," as concurring in the ill-success of secondary operations.

Bromfield * states, that before his time the operation had been performed in the British armies, but unsuccessfully, which I believe was frequently the case when formerly attempted. It is now, however, the reverse, is in general successful, and performed by military surgeons, without hesitation or fear; and I trust I have proved, that this once formidable operation may now be considered as safe, as simple, and as little hazardous, as any other of importance performed on the human body.]

AMPUTATION OF THE HEADS OF BONES.

In a letter, dated 1782, and addressed to Mr. Pott, Mr. Park, surgeon of the Liverpool Hospital, made the proposal of totally extirpating many diseased joints, by which the limbs might be preserved, with such a share of the motions which nature originally allotted, as to be considerably more useful than any invention which art has hitherto been able to substitute.

Mr. Park's scheme, in short, was to entirely remove the extremities of all the bones, which form the joints, with the whole, or as much as possible, of the capsular ligament; and to obtain a cure by means of callus, or by uniting the femur and tibia, when the operation was done on the knee; and the humerus, radius, and ulna, when done on the elbow; so as to have no moveable articulation in those situations.

To determine whether the popliteal vessels could be avoided without much difficulty in the excision of the knee, Mr. Park made an experiment on the dead subject. An incision was made, beginning about two inches above the upper end of the patella, and extending about as far below its lower part. Another one was made across this at right angles, immediately above the patella down to the bone, and nearly half round the limb, the leg being in an extended state. The lower angles formed by these incisions were raised, so as to lay bare the capsular ligament; the patella was then taken out; the upper angles were raised, so as fairly to denude the head of the femur, and to

allow a small catling to be passed across the posterior flat part of the bone, immediately above the condyles, care being taken to keep one of the flat sides of the point of the instrument quite close to the bone, all the way. The catling being withdrawn, an elastic spatula was introduced in its place, to guard the soft parts, while the femur was sawn. The head of the bone thus separated, was carefully dissected out; the head of the tibia was then with ease turned out, and sawn off, and as much as possible of the capsular ligament dissected away, leaving only the posterior part covering the vessel, which on examination had been in very little danger of being wounded.

The next attempt was on the elbow, a simple longitudinal incision was made from about two inches above, to the same distance below, the point of the olecranon. The integuments having been raised, an attempt was made to divide the lateral ligaments, and dislocate the joint; but this being found difficult, the olecranon was sawn off, after which the joint could be easily dislocated, without any transverse incision, the lower extremity of the os humeri sawn off, and afterwards the heads of the radius and ulna. This appeared an easy work; but, Mr. Park conceives the case will be difficult in a diseased state of the parts, and that a crucial incision would be requisite, as well as dividing the humerus, above the condyles, in the way done with respect to the thigh bone.

Mr. Park first operated, July 2, 1781, on a strong, robust, sailor, aged 33, who had a diseased knee, of ten years standing. The man's sufferings were daily increasing, and his health declining. Mr. Park, in the operation, wished to avoid making the transverse incision, thinking that after removing the patella, he could effect his object by the longitudinal one; but, it was found that the difference between a healthy and diseased state of parts, deceived him in this expectation. Hence the idea was relinquished, and the transverse incision made. The operation was finished exactly as the one on the dead subject related above. The quantity of bone removed was very little more than two inches of the femur, and rather more than one inch of the tibia. The only artery divided was one on the front of the knee, and it ceased to bleed before the operation was concluded, but the ends of the bones bled very freely. To keep the redundant integuments from falling inwards, and to keep the edges of the wounds in tolerable contact, a few sutures were used. The dressings were light and superficial, and the limb was

* Page 209 of his *Chirurgical Observations and Cases*.

put in a tin case, sufficiently long to receive the whole of it, from the ankle to the insertion of the gluteus muscle.

We shall not follow Mr. Park throughout the whole treatment. Suffice it to remark, that the case gave him a great deal of trouble, and that it was attended with many embarrassing circumstances, arising chiefly from the difficulty of keeping the limb in a fixed position, the great depth of the wound, and the abscesses and sinuses, which formed in the part. On the other hand, however, the first symptoms were not at all dangerous. But, the patient was obliged to keep his bed nine or ten weeks, and it was many months more before the cure was complete. The man afterwards went to sea, and did his duty very well, so useful was his limb to him.

Since the publication of the letter addressed to Mr. Pott, another excision of the knee has been done by Mr. Park. This operation was performed on the 22d of June, but the event was unsuccessful, as the patient lingered till the 13th of October, and then died.

About the same time that Mr. Park made his proposal, P. F. Moreau, a French surgeon, wrote in favour of a similar method. It only seems necessary to notice here the difference in Moreau's plan of operating from that adopted by our countryman. Moreau, the son, who has published the account, observes that the multiplicity of flaps is unnecessary, as two answer every purpose; and he deems Mr. Park's direction to remove the olecranon, if this be free from caries, at least useless. Moreau, junior, operated on the elbow as follows: he plunged a dissecting scalpel in upon the sharp edge, or spine of the inner condyle of the os humeri, about two inches above its tuberosity; and, directed by the spine, he carried the incision down to the joint. He did the same on the other side, and then laid the two wounds into one, by a transverse incision, which divided the skin and the tendon of the triceps, immediately above the olecranon. The flap was dissected from the bone, and held up out of the way, by an assistant.

The flesh which adhered to the front of the bone, above the condyles, was now separated, care being taken to guide the point of the instrument with the fore-finger of the left hand, and, when the handle of the scalpel could be passed through between the flesh and the bone, M. Moreau allowed it to remain there, and sawed the bone through upon it. The removal of the piece of bone was next finished, by detaching it from all its adhesions. The removal of the heads of the radius and ulna, remaining to be done,

was more difficult, and the first flap being insufficient, it became necessary to make another. The lateral incision, at the outer side of the arm, was extended downwards, along the external border of the upper part of the radius. The head of the radius was separated from the surrounding parts; its connexion with the ulna destroyed, and a strap of linen was introduced between the bones, to keep the flesh out of the way of the saw. The radius was sawn through, near the insertion of the biceps, which was fortunately preserved. Some remaining medullary cells, filled with pus, were removed with a gouge. The ulna was not exposed, by extending the lateral incision on the inner side of the arm. Thus another flap was made, and detached from the back part of the fore-arm, and that part of the bone which it was wished to remove. The bone, separated from every thing that adhered to it, and a strap of linen being put round it to protect the flesh, about an inch and a half of it was sawn off, measuring from the tip of the olecranon, downwards. A few diseased medullary cells were taken away with the gouge. Two or three vessels were tied, and the flaps were brought together with sutures. In a fortnight this man became so well, that he was allowed to go wherever he pleased, with his arm supported in a case. The arm was at first powerless, but it slowly regained its strength, and the man could ultimately thresh corn and hold the plough with it, &c.

Seven months after another operation, performed in the same way as the preceding one, by Moreau the father, the patient was completely cured, and two years after this period, the flexion of the fore-arm on the arm, was very distinct. In another case, only one longitudinal incision, and a transverse one, were made, the flap of course was triangular. The patient got well in six weeks, and in three months more joined his regiment.

In all Moreau's cases, the flexion and extension of the fore-arm were preserved, which circumstance no doubt depended very much on the insertion of the biceps not being destroyed. After the excision of the knee, however, the bones grew together.

Moreau, junior's, method of operating differed from his father's, in having the patient in a recumbent, instead of a sitting, posture, and in sawing the os humeri before it was dislocated.

In a knee case, Moreau the father operated as follows:—He made a longitudinal incision on each side of the thigh, between the vasti and the flexors of the leg, down to the bone. These incisions began

about two inches above the condyles of the femur, and were carried down along the sides of the joint, till they reached the tibia. They were united by a transverse cut, which passed below the patella, down to the bone.

The flap was raised; the patella was attached to it, but being diseased, was dissected out. The limb was then bent to bring the condyles of the femur into view. As it was desired to cut them from the body of the bone, before dislocating them, every thing adhering to them behind, where they joined the body of the bone, was separated, and, at that place the fore-finger of the left hand was passed through, in order to press back the flesh from the bone, and on that the saw was used. The knee having been bent, Moreau drew the cut piece towards him, and easily detached it from the flesh and ligaments.

The head of the tibia was laid bare by an incision, nearly eighteen lines long, made on the spine of that bone. The first lateral incision on the outer side of the knee, was extended nearly as far down on the head of the fibula. Thus were obtained one flap, which adhered to the flesh filling up the interosseous space, and another triangular flap, formed of the skin, covering the inner surface of the tibia, which bone was of necessity exposed, before the saw could be applied.

Upon raising the outer flap, the head of the fibula came into view, and, after being separated from its attachments, was cut off with a small saw. The inner flap was then raised, and the tibia, having been separated from the muscles behind, its head was sawn off.

It does not appear necessary to insert in this work the account of cutting out the ankle joint; an operation which will never be extensively adopted; nor shall I add any thing more concerning the mode of removing, in a similar way, the shoulder joint. In treating of amputation in this situation, I have already said enough, and whoever wishes for further information, respecting this practice, must refer to Dr. Jeffray's Work, entitled "*Cases of the Excision of Carious Joints.*" This publication contains all that is known on the subject. Dr. Jeffray has recommended a particular, and, indeed, a very ingenious, saw, for facilitating the above operation. The saw alluded to is constructed with joints, like the chain of a watch, so as to allow itself to be drawn through behind a bone, by a crooked needle, like a thread, and to cut the bone from behind forward, without injuring the soft parts. An instrument of this kind was executed in London, by Mr. Richards, who was as-

sisted in making it by his nephew, the present Mr. Richards, of Brick-lane. In placing the saw under a bone, its cutting edge is to be turned away from the flesh. Handles are afterwards hooked on the instrument.

In my treatise on the diseases of the joints, which was honoured with the premium for 1806, by the College of Surgeons in London, I have made the following remarks on the excision of the large joints. "My sentiment has been already stated, with regard to the time, when every hope of curing a diseased joint ought to be abandoned. I have stated, that the approach of dissolution, in other words, the sunk state of the system can be the only solid reason for amputation, and that, as long as the patient's strength is not subdued by the irritation of the local disease, humanity dictates the propriety of persevering in an attempt to save the affected limb, &c. Will a patient, greatly reduced by hectic symptoms, be able to recover from so bold and bloody an operation, as the dissection of the whole of the knee-joint out of the limb? If some few should escape, with life and limb preserved, would the bulk of persons, treated in this manner, have the same good fortune? I cannot admit, that the extirpation of the whole of so large an articulation as the knee, can be compared with the operation of amputation, in point of simplicity and safety. However, it is not on the difficulty of practising the former, that I would found my objections; for, I believe, that any man possessing a tolerable knowledge of the anatomy of the leg, might contrive to achieve the business." "The grounds on which I shall at present withhold my approbation from the attempt to cut out large joints, are the following:—1. The great length of time which the healing of the wound requires. Whoever peruses the case of Hector McCaghan, will find that the operation was performed on the 2d of July, 1781, and that it was February 28th of the following year, before all the subsequent abscesses and sores were perfectly healed. This space of time is very nearly eight months! Mr. Park describes the patient as a strong, robust sailor, and gives no further particulars concerning the state of his constitution, than that his health was declining. I entertain little doubt, that if the excision of the knee had been performed in that state of the health, in which amputation becomes truly indispensable, this man would not have survived the illness arising from the operation. The only other case, in which Mr. Park extirpated the knee, ended fatally. In the instance related by Moreau, there

seemed, indeed, to be considerable debility. This patient escaped the first dangers consequent to so severe an operation; and, *after three months confinement*, the patient was in such a state, that *Moreau expected he would be able to walk upon crutches in another month or six weeks!* The young man in the mean time was attacked by an epidemic dysentery, and died. 2. Even supposing the excision of the knee to be followed with all possible success, is the advantage of having a mutilated, shortened, stiff limb, in lieu of a wooden leg, sufficiently great to induce any man to submit to an operation, beyond a doubt infinitely more dangerous than amputation? I think not" (See the author's *Treatise on the Diseases of the Joints*, p. 138.)

AMPUTATION OF THE FINGERS AND TOES, AND PART OF THE FOOT.

Mr. Samuel Sharp observes, that the amputation of the fingers and toes is better performed in their articulation, than by any of the other methods. For this purpose a straight knife must be used, and the incision of the skin be made not exactly upon the joint, but a little towards the extremity of the finger, that more of it may be preserved for the easier healing afterwards. It will also facilitate the separation in the joint, when you cut the finger from the metacarpal bone, to make two small longitudinal incisions on each side of it first.

It may happen that the bones of the toes, and part only of the metatarsal bones, are carious, in which case the leg need not be cut off, but only so much of the foot as is disordered. A small spring saw is here better than a large one. When this operation is performed, the heel and remainder of the foot, will be of great service, and the wound heal up safely, as Mr. Sharp has once seen. (*Operations of Surgery*.)

In amputating the fingers and toes, the operation is greatly facilitated by cutting into the joint when it is bent. Having made an opening into the back part of the capsule, one of the lateral ligaments may easily be cut, after which nothing keeps the head of the bone from being turned out, and the surgeon has only to cut through the rest of the exposed ligamentous and tendinous parts.

Some recommend making a small semicircular flap of skin to cover the bone; but this is quite unnecessary, if care be taken to draw the skin a little up, and to cut where Mr. Sharp directs.

Mr. Hey describes a new mode of removing the metatarsal bones, which, on

repeated trial has fully answered his expectations. Mr. Hey makes a mark across the upper part of the foot, to denote where the metatarsal bones are joined to those of the tarsus. About half an inch from this mark, nearer the toes, he makes a transverse incision, through the integuments and muscles covering the metatarsal bones. From each extremity of this cut, he makes an incision along the inner and outer side of the foot to the toes: he removes all the toes from the metatarsal bones, and then separates the integuments and muscles, forming the sole of the foot, from the inferior part of the metatarsal bones, keeping the edge of the knife as near the bones as possible, in order to expedite the operation, and preserve as much muscular flesh in the flap as can be saved. He then separates the four smaller metatarsal bones, at their junction with the tarsus, and divides, with a saw, the projecting part of the first cuneiform bone, which supports the great toe. The arteries being tied, Mr. Hey applies the flap, which had formed the sole of the foot to the integuments, which remain at the upper part, and keeps them in contact with sutures. The cicatrix being situated at the top of the foot, is in no danger of being hurt, while the place where the toes were situated, is covered with such strong skin, viz. what previously formed the sole of the foot, that it cannot be injured by any moderate violence. (See *Practical Observations in Surgery*, p. 535, &c.)

It is certainly very often quite unnecessary to remove the whole foot, when the metatarsal bones are carious, and every other part of the leg is sound. The remainder of the foot is of immense service in walking, as the use of the ankle is not destroyed. Mr. Hey very judiciously recommends dissecting out the metatarsal bone of the great toe, when diseased, from the cuneiform bone, instead of sawing it. The latter plan cannot be easily accomplished, without removing part of the integuments and muscles, and making a transverse, as well as a longitudinal, incision. These disagreeable things may be avoided by following Mr. Hey's method.

The metatarsal bone of the little toe may be removed in a similar way.

It is very awkward to saw the metatarsal, and metacarpal bones, and, when the middle ones are to be divided, is indeed hardly practicable, without injuring the soft parts. I am, therefore, of opinion with Mr. C. Bell, that, instead of a formal amputation, it is better to extract the diseased bones from the foot, or

hand, as, indeed, Mr. Hey is in the habit of doing.

After the perusal of the foregoing account of the subject of amputation, I think a surgeon will derive many useful hints from the valuable observations of M. Louis, although his mode of operating is not now imitated, and several of the things, which he recommends, are not at present attended to, I am of opinion, that the practitioner, who is acquainted with his remarks on this operation, will have a decided superiority over another surgeon that is entirely ignorant of them. Many of the observations are incontrovertible; the principles, inculcated, are generally founded on the most correct anatomical considerations; and, in the present indiscriminate fashion of dissecting up the skin, often very unnecessarily, and always to the severe suffering of the patient, I am convinced, that M. Louis's sentiments may be studied with advantage. It is not to be inferred, however, that I suppose the double incision a bad mode of operating; but, only that I think it the duty of every surgeon to know where the dissection and preservation of skin are necessary, and where not.

ABSTRACT FROM THE MEMOIRE SUR LA
SAILLIE DE L'OS APRES L'AMPUTATION,
&c. BY M. LOUIS.

The contraction of the muscles has hitherto appeared the most probable reason of the protrusion of the bones, after the amputation of the thigh. There is no complaint of the bones protruding, after the amputation of the arm or fore-arm; and if we observe things carefully in the amputation of the thigh, we shall constantly see muscles protruding from the level of the other flesh, by a real elongation, whilst there are some muscles that are drawn back, even on dead bodies, where undoubtedly the contractile power of the muscles cannot be supposed to act. The solution of these difficulties will remove all the doubts which may arise on the subject here treated of.

The protrusion of the bones will never take place, so long as they are immediately encompassed with the fleshy substance of the muscles: this proposition is incontestable. The state of the skin, whether longer or shorter, conduces nothing to this protrusion, as we have proved. Thus the precaution of drawing it upwards, and preserving as much of it as possible, will not prevent this inconvenience. We do not find this to be the case, either in the leg or fore-arm, because the greater part of the muscles, which are there cut, adhere to the bones, and are

contained by aponeuroses, which fix them in their situation. In the amputation of the arm, there is only the biceps-muscle, which can be drawn back towards the upper part. The extremity of the humerus always remains encompassed with the brachial and extensor muscles, which are retained and fixed by their adhesions to the bone itself. From hence proceeds the facility of curing amputations of the arm, without exfoliation of the bone. But, this is not the case with the thigh. Only the crural muscle is there fixed to the bone in its whole extent; but this muscle is very slender, its fibres short, and converging to its axis, which is parallel to that of the bone. The vastus internus, the vastus externus, and the triceps muscles, have also adhesions to the femur; but they are not attached to it, except by their interior edge. The plane of these muscular substances is disembarassed and pretty large, and consequently capable of changing their direction, and folding over each other, after their resection. All the other muscles are separated from each other, as well as the preceding, by the cellular texture, and there is none of them which, in its direction, is parallel to the axis of the femur. Every one of them cut it, by more or less acute angles. From thence it happens, that when these muscles are divided, they change their direction; there is nothing to maintain them, in order to form an equal surface at the extremity of the stump. I have examined minutely into these matters, by the inspection of dead bodies, and recollected, on this occasion, the amputations I myself had made of the thigh, and the much greater number which I had seen performed by others. I do not think there can be any manner of doubt with regard to this fact. I am likewise fully persuaded, that there are no means of preventing this change of situation in the muscles of the thigh, after its amputation; but it seems to me, that there is a very simple method of preventing the ill effects of this change, with regard to the protrusion of the bone.

It is laid down as a rule, that, besides the tourniquet, which is fixed to prevent the hemorrhage, during the operation, there should be applied a tight ligature immediately above the part, where the circular incision is to be made. All authors, except Le Dran, recommend the use of this ligature, in order to sustain the flesh in such a manner, that it might be cut with the instrument, smoothly and evenly, and with facility. Guy de Chauliac would even have the incision made between two ligatures: Verduc and several others have given the same advice.

The modern practice is, not to remove the ligature that sustains the flesh, till after the bone is sawn; and this even our books of surgery prescribe. But in the amputation of the thigh, in case we would prevent the protrusion of the bone, (which it has been impossible to avoid, notwithstanding all the precautions hitherto indicated) we must take care to remove the ligature that secured the flesh, as soon as the section of the soft parts shall be made. The muscles, being set at liberty, will be drawn back immediately, and change their situation; we shall then be able to raise the flesh with the retractor, to direct the bistoury on the crural muscle, and to cut the point of adhesion of the vasti and the triceps at the posterior spine of the femur. By this method the bone may be very easily sawn, three fingers breadth higher, than it could have been, had it been sawn to the level of the flesh sustained by the ligature.

This remark will appear very simple to many; but this simplicity does not diminish, either the importance or solidity of it. This consideration induces me to refer to another memoir, a series of reflections on the same subject, and to conclude the present with the same words, which Monro, a celebrated professor of Edinburgh, makes use of, at the beginning of his remarks on amputation of the larger extremities. "There is," says he, "in the operations of surgery, an infinity of minute circumstances, which do not appear, at first sight, very important, and which, notwithstanding, the observation or omission of in practice, has considerable consequences, by rendering the cure more expeditious or more tedious; by bringing on or preventing dangerous symptoms; by preserving the patient from violent pains, or increasing them, and putting his life in danger; circumstances, the good or ill effects of which ought consequently to be examined with attention, and concerning which, those who treat of these matters, with a view to the public utility, ought to give the necessary directions."

FROM THE SECOND MEMOIRE SUR L'AMPUTATION DES GRANDES EXTREMITÉS, BY M. LOUIS.

The frequent opportunities of amputating limbs, and the simplicity of the objects of this operation, one might suppose, ought long ago to have brought it to the highest pitch of perfection; but, says M. Louis, it frequently happens, that the most familiar things are those, to which we pay the least attention. Modern writers regard amputation, as an operation

much more embarrassing, than difficult; and it is, perhaps, on account of its object being simple, and of the proceedings to be followed in its performance, not requiring great dexterity, that surgeons adhere to methods, to which they have been accustomed, without examining, whether the practice is as perfect as it is capable of being rendered. The force of custom has not imposed on me; I have made my remarks on this operation; and, I hope, that such readers, as will duly and impartially consider them, will find them not destitute of utility. I do not pretend to insinuate, that most of the rules, which have hitherto served as a guidance, are faulty; but, I am of opinion, that the best are too vague, and ought to be made more determinate. However solid they may appear in general, they will be found respectively erroneous when applied to particular cases, and great blunders may therefore be committed in their application. The design of amputation is to separate from the rest of the body, a part, the endeavour to preserve which might cause the patient's death. The ancient professors of surgery appear to have always been more occupied about the end, proposed in the practice of this operation, than solicitous to improve the means, by which its pain and inconveniences might be lessened. The nature of the parts, divided in each kind of amputation; their attachments; the change, which naturally or accidentally, takes place in their disposition after the operation; even the uses, which the parts must serve after the cure; are all considerations, says M. Louis, which appear to me to demand different modes of proceeding, which may be usefully varied according to the diversity of circumstances. In this point of view, I intend to examine the received precepts, relative to the surgery of amputations, and shall offer a series of reflections, which seem to me to be applicable to the operation, in respect to each particular member.

SECTION I.

REMARKS ON THE AMPUTATION OF THE THIGH, BY M. LOUIS.

Of all amputations, that of the thigh is the most liable to inconveniences, arising from the method of operating. I have elsewhere explained the reason of this fact (*Vid. Mém. de l'Acad. de Chir. Tom. 5, p. 273, Edit. in 12mo.*) and I have pointed out a very simple mode of avoiding them. So important a subject deserves a more circumstantial detail, which I shall now offer with as much precision as is in my power.

The patient being put into a suitable situation, and the tourniquet applied,* an assistant is to draw the skin up towards the upper part of the thigh, where it is to be kept by means of a roller, which is to be applied, with sufficient tightness, round the limb, a little above the place, where the incision is to be made. This band makes the skin tense, steadies the flesh, and serves as a guide for the operator, in the direction of his instrument.

Guy de Chauliac applied a second ligature, below the place, where the amputation was to be done. Experience proves the usefulness of this plan, and several practitioners adopt it, although our modern writers have not thought proper to make any mention of it. The skin and flesh, says M. Louis, cannot be too carefully fixed; for the incision can then be made more easily, and with greater regularity.

There is no occasion to repeat here what I have observed in my first memoir against what is called the double incision. It is for the thigh, that the preliminary division of the skin and fat is the most strongly recommended. Heister says, that he has often seen the bone project, like a stick, two, or three finger-breadths, beyond the flesh, in consequence of the double incision not having been practised. *Si muscoli una cum cute una eademque sectione discinduntur, muscoli hic dissecti fortissimi tantopé sursum retrahuntur, quemadmodum sæpius vidi, ut os femoris post alteram tertiamve deligationem, ad duorum, imò trium, transversorum digitorum longitudinem, super carnem, instar baculi cujusdam emerit.* (Heister, Instit. Chirurg. de Amput. Femoris.)

Notwithstanding this authority, continues M. Louis, I am bold enough to assert, that on the thigh, this preliminary incision of the skin is the least proper. The usefulness of this plan would consist in saving skin enough to cover the muscles; but, their retraction could not be at all lessened by having a greater length of integuments. The precaution that is taken to pull the skin upward, and keep it so with a band, is the more effectual in amputation of the thigh, inasmuch as the retraction of the muscles is here greater. The inconvenience is, that the end of the bone projects beyond the surface of the wound, unsurrounded by the soft parts, which naturally cover it. Besides M. Louis contends, that the preservation of a larger quantity of skin

will not supply the deficiency of muscle, with which it is always desirable to cover the bone. Hence, he maintains, that this first incision, so much extolled, is absolutely useless, and that it unnecessarily lengthens the operation, and increases the suffering of the patient. He lays it down, as a precept, founded on reason and experience, that *we should begin the operation by a deep incision, which is to divide the muscles and skin at the same stroke.* The only thing to be observed, in order to make this first incision as well as possible, is to do the whole of the cut with one turn of the amputating knife; an object, which may be accomplished with ease. The surgeon, placed externally, with one knee on the ground, and his right arm under the thigh, which is about to be amputated, is to take hold of the handle of the knife, which is to be presented to him perpendicularly between the patient's thighs. In this position, the point of the instrument is turned towards the operator's chest. Now, if he raises his right hand considerably, and turns his wrist very prone, he will be able to commence the incision externally, carrying it from above downwards. In this first direction of the instrument, he will cut the muscles, covering the outer part of the thigh-bone. Then, carrying the knife in a contrary direction, from below upwards, and round the anterior part of this bone, he will cut the extensor muscles. The instrument is afterwards to be directed from above downwards, in order to divide the muscles situated on the inside of the thigh; and the surgeon, now rising up, is to complete the circular incision, by cutting the parts on the posterior side of the limb. By following this plan, says M. Louis, the flesh will be uniformly cut by one stroke of the knife; and the operator, not having occasion to reapply the instrument several times, he will run no risk of making an irregular section.

As soon as the incision is made, a largish interspace appears betwixt the divided parts. I have remarked, says M. Louis, that this separation was much more considerable in amputations, where only one ligature was applied round the limb. Hence, the gaping of the wound appears to depend principally upon the retraction of the muscles towards their inferior attachments. The ligature which fixes the skin, and presses the whole circumference of the member, above the incision, is an obstacle to the shortening of the muscles, and it should therefore be removed, as soon as the cut has been made. The utility of this method is obvious. The muscles, whose action will now be no more restrained, (especially if M. Petit's tour-

* Among the different authors, who may be consulted on the application of the tourniquet, it is essential not to forget Monro, in Edinb. Essays, vol. 4.

niquet be employed,) will contract, and change their situation, according to the difference of their direction. A small scalpel may then be used, for dividing the cruralis muscle, which is intimately attached to the femur, and may now be cut even higher than the level of the retracted parts. The other portions of muscles attached to the spine of the os femoris, are next to be divided on the same line, and, lastly, the periosteum.

The slit bandage, named a retractor, will be an easy means of enabling the surgeon to cut such fleshy fibres, as are adherent to the bone. There are some writers, who say, that it may be dispensed with; but, it deserves notice, that they have only proscribed its use, when employed with a view of drawing the soft parts upward, in order to protect them from the action of the teeth of the saw; and, it is true, says M. Louis, that in the received mode of operating, the retractor is not absolutely necessary, because the bone is sawn on a level with the flesh, which is steadied and fixed by the ligature. But, as I expressly recommend such ligature to be removed, in order to divide the periosteum, and to saw the bone, higher than the level of the soft parts, the retractor becomes extremely useful. We shall merely observe, that the ends of this slit bandage ought not to be applied too closely to the bone, since its design is to push upwards the soft parts, which are loose and unfixed, in order to facilitate the division of those fleshy fibres which lie close to the bone, and are firmly attached to it. I shall say nothing about the sawing of the bone, having nothing particular to urge on this point.

The operation, says M. Louis, practised in the way, which I have just now been describing, will be attended with all the advantages, which have been constantly desired, and for the acquisition of which, methods have been practised, which are less simple, and liable to many inconveniences. I here allude to the amputations with two flaps. It is only necessary to read the description of such operations (*Le Dran, Traité des Opérations*), to be convinced, how much this method of amputating increases the patient's suffering; and the idea, thus collected, would not nearly equal that, which would arise from seeing the method tried on the dead subject. We are directed, first to make a circular incision, three or four finger breadths, lower down, than the place, where we intend to saw the bone. The assistant, who holds the upper part of the limb, is to draw the skin upward, and, on a level with it, the flesh is to be divided down to the bone. The point of the knife is then

to be pushed through the thickness of the flesh to the bone, exactly at the place where this is to be sawn; and a longitudinal wound is to be made in the integuments and muscles, which is to terminate at the circular incision. The same is to be done on the opposite side. These two incisions must be so managed, that the large vessels will be situated in the middle of one of the flaps. Both these flaps are to be dissected so as to expose the bone; they are then to be drawn up, and kept in this position by a linen retractor. The operator now has an opportunity of making a circular incision through the fibres attached to the bone, and at the same time through the periosteum, on a level with the base of the flaps. Lastly, the bone is to be divided with a saw, that has a very narrow blade.

This concise account of the manner of executing the flap amputation will enable the reader to judge, how painful such operation must be. Without saying anything about the first cut through the integuments, which is made without any reasonable motive, and may be dispensed with, it is manifest, that the patient has to suffer, in addition to what he suffers in the other operation, two perpendicular wounds, and the dissection of the two flaps thus produced. There can be no doubt, that the swelling and inflammation of the stump, the pain, fever, and all the consequent symptoms, already so formidable, independently of any other cause, in the operation done in the most simple manner, must be much more considerable, in proportion to the number of parts divided, and the larger surface of the wound. And for what is all this train of symptoms and dangers encountered? The sole object is to prevent the protrusion of the bone, to make the soft parts extend beyond its extremity, and to avoid an exfoliation, the tediousness of which sometimes seriously protracts the cure. This last consideration, says M. Louis, is futile enough, since the prolongation of the treatment from this cause does not put the patient's life in any danger. However it may be, the operation, which I have described, has all these advantages; the end of the bone is covered with flesh, and all the intentions, proposed in the flap amputation, are fulfilled in a manner, that is at once easy, less painful, and as free from inconveniences as possible.

The reasons for preferring the method of amputating the thigh, which I have been explaining, admit of intuitive demonstration. I have performed the operation in the presence of many, who are capable of appreciating its merit. The renewal of this mode of practising ampu-

tation will be as advantageous for the afflicted, as honourable to surgery. I say, the renewal; for the plan is very ancient, and the first description, which we have of the manual of amputating limbs, is on the principle, which we have been detailing more fully, in order that it may be better understood. Upon this subject, Celsus has thus expressed himself: *Inter sanam vitiatamque partem incidenda scapello caro usque ad os --- reducenda ab eo sana caro et circa os subsecunda est, ut eâ quoque parte aliquid ossis mûletur; deinde serrulâ præcidendum est, quam proximè sanæ carni etiam inhaerenti. --- Cutis sub ejusmodi curatione laxa esse debet, ut quam maxime undiquè os contegat.* (Corn. Celsus, lib. 7. cap. ultimo.)

In an historical dissertation on the amputation of limbs, which is inserted in the *Mémoires de l'Académie Royal des Sciences*, année 1732, the late M. Petit (the physician) has quoted this passage in Celsus in which he finds much obscurity. Operations, apparently the most easy, are attended with delicacies, of which only those can be aware, who are in the habit of seeing and reflecting upon them. A surgeon, accustomed to the performance of amputation, and to the consideration of the inconveniences, to which the operation is liable, must be struck with the flash of light, that issues from the words of Celsus. Mr. S. Sharp, a celebrated surgeon in London, is in this case; but, prepossessed about the practice of the day, he has only perceived in Celsus a glimmer, that has astonished him; he knew its safety; but, he did not pursue it. A judgment may be formed of what I have been remarking, from the passage, that I am going to cite from Mr. Sharp's work.

"The first inconvenience, which I have mentioned, as a consequence of the ancient method of amputating, was the protrusion of the bone; for, making the incision directly down to the bone at once, the muscles and skin afterwards withdrew, leaving a large portion of it either naked, or so little covered, that it always perished, and made an exfoliation necessary. This exfoliation was often a tedious and painful work, and frequently, by long preventing the cure, reduced the wound at last to an habitual ulcer. Or, if the wound did heal, the cicatrix proved so large, and the stump so pointed, that it was liable to ulcerate again.

"These mischiefs resulted purely from the want of a lax skin in the neighbourhood of the wound; for, cicatrization is not effected by the mere generation of a new skin; but, chiefly, by the elongation of the fibres of the circumjacent skin to-

wards the centre; and it is only when the skin resists a farther extension, that the cicatrix begins to form; from whence, it must plainly appear, that the more lax the skin is, the more readily will the wound heal, and the smaller will be the cicatrix.

"But, though the old surgeons could not apply this maxim to practice, so usefully as the moderns now do, yet, they made some efforts towards it; for, before they amputated, they drew back the skin with all their force, and, after the limb was taken off, they might bring a larger quantity of it over the extremity of the bone, and obviate, in some degree, the inconveniences I have stated. However, this seems to have been all the contrivance they were provided with to answer so great an end; unless, it may be admitted, that Celsus had a faint idea of the double incision; and, to speak my own mind, I question, whether it can be doubted. In his chapter on the gangrene, he unluckily happens to be more concise, than usual;* but, I think, he expressly says, that, after we have cut down to the bone, we must draw back the muscles, and cut deep round the bone, so that a portion of it may be laid bare; after which, it is to be sawn off, as close as possible to the flesh. He tells us, that, by this method of treatment, the skin will be so lax as almost to cover the bone.

"Perhaps, I may have mistaken Celsus's meaning; if I have not, it has been a great misfortune to mankind, that so beneficial an instruction should have been either overlooked, or misunderstood. But, it is certain, no writer has copied him, and the double incision, as now perfected, is the invention of another great man (*Cheselden*;) to whom posterity will be always indebted for the many signal services he has done to surgery.

"It must be confessed, however, that, notwithstanding we derive such benefits

* This criticism, passed by Mr. Sharp on Celsus, M. Louis thinks, might be answered by citing what a great man in his time has said of the great men of antiquity... Ils avoient l'esprit élevé, des connoissances variées, approfondies, et des vues générales; et s'il nous parût au premier coup d'œil qu'il leur manquât un peu d'exactitude dans de certains détails, il est aisé de reconnoître en les lisant avec réflexion, qu'ils ne pensoient pas que les petites choses méritassent une attention aussi grande, que celle qu'on leur a donnée dans ces derniers tems. (*M. de Buffon, Histoire Naturelle, Premier Discours, Tome 1.*)

from the double incision, the contractile disposition of the muscles, and, perhaps, of the skin itself, is so great, that, in spite of any bandage, they will retire from the bone, especially in the thigh, and sometimes render the cure tedious.

"To remove this difficulty, I have lately, on some occasions, made use of the cross-stitch, &c. (*Sharp's Critical Inquiry into the present state of Surgery*, p. 282, 284, Edit. 4.) The best way of remedying this inconvenience, says M. Louis, is to follow the method, which Celsus has described. It seems that Mr. Sharp was the more called upon to adopt it, inasmuch as he rightly considered it as a *great misfortune to mankind, that so beneficial an instruction should have been either overlooked, or misunderstood*. Led away, however, by the general prejudice, he commends the pretended advantages of the double incision in saving as much skin as possible; but, he immediately afterwards owns the insufficiency of this method, and concludes with proposing, as a very useful assistance, an ancient practice, that is absolutely useless and hurtful. This is the opinion, which Vanhorne entertained of it,* and, in my first memoir on amputation, I have adduced facts, which confirm the sentiment of this writer. Such persons, as will take the trouble of reading attentively the reasons, which Mr. Sharp urges in support of this method, will see, that his arguments are by no means strong; and, says M. Louis, there is every reason to hope, that, after he has consulted experience, he will alter his opinion, and be generous enough to condemn it. By such conduct, Mr. Sharp has already gained great honour on points of equal importance. Instances of this kind are never afforded, except by men truly great.

General rules, how solid soever they may be, almost always admit of modifications, according to the diversity of the cases, to which they are to be applied. The flap amputation furnishes us with a proof of this observation. I believe, that I have urged strong reasons against this operation: but, it is not to be inferred, that it should be proscribed in all cases. There are even some instances, in which it appears

to me, that it ought to be preferred to the other method. In a comminuted fracture, with laceration of the soft parts, where amputation is indispensable, if the circumstances of the accident are such, that there are fewer parts to be divided, and, consequently, the pain will be less, in forming the flaps, than in amputating higher up, according to the other method; in this case, says M. Louis, all other things being equal, I should not hesitate to perform the flap operation. The cases, in which this mode deserves the preference, cannot be precisely specified. Discretion is necessary to rate the advantages and inconveniences of either method, in respect to particular circumstances, as well as a great deal of sagacity, to be able, with a knowledge of the cause, to select the most proper course in delicate occurrences, where nothing less, than the life of a man, is at stake.

SECTION 2.

REMARKS ON THE AMPUTATION OF THE ARM, BY M. LOUIS.

Authors have made no difference, says M. Louis, between the method of amputating the arm, and that which they have advised for cutting off the thigh. External appearances, indeed, would lead to a supposition, that these members are only dissimilar in shape; and that such difference necessarily requires none in the mode of operating. But, when these limbs are viewed less superficially, and the relative disposition, and action of the component parts of the arm are seriously studied, a source of useful reflections will be discovered, with respect to the conduct, which ought to be pursued, in order to perform the amputation of this member with success.

The humerus, from its middle to its lower part, is covered by muscles, which are adherent to it, and whose action is direct and parallel to the axis of the bone. This is not the case with the thigh: most of the muscles, which form its bulk, are either not at all adherent to the bone, or are only attached to it by surfaces of small extent. Besides, their direction is not parallel to the axis of the femur. Hence, as soon as they are divided, they draw themselves a great way from it, less on account of their retraction, than their change of situation in regard to the bone; for, in becoming merely retracted, they retain their parallelism. In the arm, there is only the biceps muscle, along the front of the limb, which retracts itself under the skin, and how badly soever amputation may be performed, no apprehensions are ever entertained of the de-

* Cum Hildano rejicimus Parzi methodum descriptam cap. 21, cum quatuor locis cutis fimbrias acu et filo traducto, ad se invicem adducit, et denudatum os obtegere satagit, ne ab aëre lædatur. Quorum eum opus est ægrum non pro futuris carnicibus excruciare? (*Microtechnie*, p. 485. See also *Hildanus, lib. de Gangrænâ et Sphacelo*.)

denudation of the bone.* The stump is only liable to be pointed, which renders the cure more tedious, than it ought to be. I have several times observed the cause of this inconvenience in the amputation of the arm, and I have noticed it even in operations done by men, who had the reputation of operating well; that is to say, of operating quickly, and with all possible dexterity. The soft parts were properly supported with two ligatures, between which, an incision was made down to the bone. The periosteum having been cut, and scraped downwards, the humerus was sawn precisely on a level with the muscles, according to the received maxim, that we should endeavour to make the section of the bone, and that of the flesh uniform, so that they may appear like a smooth cut, made at one stroke. What I have always seen happen in such a case, then took place: as soon as the circular ligature was taken away, the biceps retracts itself; but, the brachialis internus, the long and short heads of the triceps, and the coracobrachialis, cannot abandon the bone, because they are adherent to it by one of their surfaces. The rest of the fibres, forming the substance of these muscles, and which are not attached to the bone, however, are retracted, and render the stump conical. The operator, engaged in stopping the hemorrhage, and applying the dressings, does not take notice of this retraction; he is entirely taken up with applying the first dressings; and he thinks, that the projection of the bone is caused by the subsequent retraction of the parts, whereas the retraction happens before his face, and is the immediate effect of the method of operating.

I have not perceived the reason of this effect, in the cases, in which I have operated myself, because I carefully followed the precepts given on this subject; and my endeavours to be exact blinded me. I only became conscious of it, as a spectator, when I was sufficiently well informed to reap instruction from the errors of my masters. The pointed form of the stump, after the amputation of the arm, may easily be prevented. If, after the first incision, made deeply down to the bone, the ligature, which supports the soft parts,

is removed, they retract. The muscular fibres, adherent to the bone, and the periosteum, may then be divided, on a level with those fibres, which the retraction has brought nearer to their superior attachment. Attention to these circumstances, simple as it may seem, will enable the surgeon to saw the bone an inch higher, than he would be able to do, without such precaution. In this way, says M. Louis, I have accomplished speedy cures, and never had any exfoliations.

The observations, which have just been offered, are only applicable to the amputation of that portion of the arm, where the fibres of the muscles are parallel to the axis of the bone. Another mode of proceeding must be followed in operating at the upper part of the member; for, the case is here altogether different. This is an important consideration, which has not hitherto been adverted to. The attachments and the direction of the different muscles, to be cut, and the alteration unavoidably made in their disposition, according to the attitude, in which the limb is placed, merit particular attention. The deltoid muscle, as is well known, covers the shoulder joint, and reaches externally nearly as far as the middle of the humerus. Its fibres are convergent to the axis of this bone, and its action is direct. In order to amputate the arm towards its upper part, the limb should form a right angle with the body. In this position, the deltoid is shortened by a strong contraction. This shortening, which precedes the division, incapacitates the fibres of this muscle from becoming any further retracted, when they are cut. The deltoid, also, not being adherent to the bone, may be pushed upward with the retractor, so that the bone may be sawn above the level of the extremity of the divided fibres. Therefore, inasmuch as this muscle is concerned, no inconvenience will arise. They are to be ascribed to the ill-made section of the tendons of the pectoralis major and latissimus dorsi. The action of these is likewise oblique, in regard to the axis of the humerus; their fibres form an angle with this bone; and, it follows from this observation, on the structure and action of the parts, that, after the circular incision, the fibres of these muscles will retract, and a gaping wound will be produced, because the shortening of the fibres will happen obliquely, on each side, in a contrary direction. The absorption of the fat, and the shrinking of the soft parts, which, in other amputations, cause the approximation of the skin towards the centre of the division, and are the chief means, by which nature accomplishes the re-union of wounds with

* The denudation of the bone is uncommon even in the thigh, says M. Louis, unless abscesses have promoted the occurrence. The change in the situation of the muscles causes the femur to form a considerable prominence; but, still this bone usually remains covered by the cruralis muscle, and some fibres of other muscles attached to its posterior crista.

loss of substance, cannot have this salutary effect in the wound, that we are considering. It is liable to degenerate into an habitual ulcer. Such instances I have seen, and the reason of them is manifest. The cicatrix never begins to form, till the skin can be extended no further. This is a reflection made by Mr. Sharp. The nearer we approach the upper part of the arm, the more we perceive the cause of this inconvenience, that is to say, of the difficulty, with which the skin extends towards the centre of the wound. The long head of the triceps, and the coracobrachialis, both run obliquely; the last from the coracoid process; the first, from the inferior part of the neck of the scapula; to be inserted into the humerus, one anteriorly, the other posteriorly. When they are cut above their attachments to this bone, there is nothing to hinder their retraction, which will take place obliquely, in contrary directions. Such disposition must obviously be unfavourable to the approximation of the skin to the middle of the wound.

The knowledge of the causes of this inconvenience ought to teach us how to prevent it; and, I believe, the object is not difficult. A preference should here be given to the flap amputation, as would be practised, were it the intention of the surgeon to perform the operation at the shoulder joint. I reserve, for another memoir, some observations on the manner of executing this amputation. Suffice it to mention the advantage of making a flap, when we have to amputate the arm high up near the shoulder. The least reflection on what has been stated, concerning the direction and action of the muscles, will shew, that they could be retained, so as to facilitate the cure, only by preserving them, with the skin, beyond the level of the bone. The making of a flap will even prevent the symptoms, which are liable to be caused by the imperfect division of the tendons of the latissimus dorsi and pectoralis major. Every thing concurs in favour of the adoption of this method. Experience proves the inconveniences of the ordinary operation, as applied to the upper part of the arm. Reason demonstrates the utility of the practice proposed, and its success has been proved by several cases. M. Trecour, surgeon-major of the regiment of Piedmont infantry, and correspondent of the Academy, has communicated to us an interesting fact on this point.

During the siege of Maestricht, three days before the suspension of arms, M. de Moyon, a lieutenant in the Piedmont regiment, was struck by a cannon ball on

the left arm. The humerus was smashed from the elbow to the upper middle portion, as high as within a finger breadth of its neck. A piece of the posterior part of the bone was left, an inch long, and shaped like the mouth of a clarionet. M. Trecour, on being sent for, went to the hospital of the trenches, and begged such of his colleagues, as he found there, to assist him with their advice. On viewing the considerable splintering, with which the wound was attended, they were of opinion, that the arm should be taken off at the shoulder joint. There were, indeed, motives in justification of their advice. When we are obliged to amputate a limb, that is broken to pieces by any kind of external violence, it is a rule to perform the operation higher up than the wound. But, if the contusing body has been propelled by the force of gunpowder, more extent is given to this precept. We are then directed to amputate above the nearest joint. The reasons, assigned for this doctrine, are principally founded on the inequalities of the bone, which is never smoothly broken, and the splinters of which are apt to extend far above the place, where the violence has operated. Even, when the bone is neither splintered, nor smashed, as far up as the joint above the injury, it is customary to perform amputation above such articulation, if the wound should be near it, under the apprehension, that the shock, which the member has received, may have injured, contused, or even lacerated the capsular ligament. This would give rise to swelling, inflammation, and abscesses of the joint; consequences, of which the patients ordinarily perish.

M. Trecour felt all the validity of these reasons: the natural inference was, that the wound, being situated near the superior articulation of the limb, the amputation must be done in that joint. This case, however, gave rise to some doubts. The patient, aged eighteen years, was of the most delicate constitution imaginable; and he seemed little able to bear so tedious an operation, the consequences of which are sometimes grievous. Such are the sinuses, which are formed along the tendons, and reach even into the substance of the muscles. The advice of M. Trecour, was, therefore, followed, which was to make two lateral incisions, to turn up the flap of the deltoid, and, if the head and neck of the humerus should be found to be unbroken, not to amputate at the joint. Things proved to be so, and the bone was sawn through at its cervix, just at the base of the fragment shaped like the mouth of a clarionet. The flaps

which were saved, extended more than two finger-breadths beyond the end of the bone.

Although the operation took up little time, the patient fell into a debilitated state, so that his life appeared to be in danger. It was necessary to support him with cordials for two days; the plan succeeded; no future bad symptoms occurred; and the patient got perfectly well.

M. Trecour assures us, that, the same day, on which this operation was performed, his colleagues had occasion to do two amputations in a similar way, for nearly the same sort of injuries, and that the cases did exceedingly well. From these facts, he makes the following inference: "Among the motives, assigned for the practice of amputating limbs higher than the articulations, above the wound, we should not so generally adopt that, which is deduced from the commotion of the ligaments, holding the heads of the bones in their cavities. It even appears, that the more the bone is broken, the less the shock and concussion must be; as may be observed in injuries of the head, where the commotion is greater, or less, on account of the resistance made by the bones of the cranium."

There are few cases, which do not offer some circumstance or another, that has not been the object of particular consideration, and that would constantly escape our notice, were we not engaged in elucidating some particular doctrine, with which it is connected. M. Trecour mentions, that he sawed the bone at the base of the end of the fracture. A cursory perusal of this circumstance does not appear to present any prospect of material improvement in practice; yet, says M. Louis, it has been of use, inasmuch as it has led us to investigate the difficulties, which occur in this operation. There is no surgeon, at all versed in practice, that has not experienced the trouble there is in fixing the part during the action of the saw, even in operations, where the limb is entire, and, consequently, where there is the best opportunity of holding it with firmness. The reason of this is self-evident. The assistants only afford moveable points of support; and whatever pains they may take to fix the extremity operated upon, they cannot prevent the motion, which takes place involuntarily in the articulation of the limb with the trunk. But, when we have to saw the end of a bone, which can hardly be laid hold of, the difficulty in fixing it must be far greater. M. Bertrandi informed me, that he has been a witness of this inconvenience. A Piedmontese officer did not

get well after amputation of his thigh, because the bone protruded. It was therefore determined to saw the projecting part off. Endeavours were made in vain to effect this operation; the limb could not be kept steady enough. M. Bertrandi then proposed a very simple means, which answered the purpose, and which he has since employed with success. It is a machine, composed of a perpendicular piece of wood, firmly fixed on a foot and notched at its upper part, so as to form a kind of fork. This notch affords the end of the bone an invariable fixed point, which renders an assistant unnecessary for this object, who may now be employed in pressing upon the limb, till the bone is half sawn through. The part must afterwards only be held laterally. With this machine, the bone cannot slip about, and it may be sawn, with as much ease, as a stick on a trestle. This means appears to me commendable on account of its simplicity, and, I believe, there are numerous occasions, on which it may be employed with advantage. In common amputations, a machine, constructed on the principle of the *Ambi* of Hippocrates, in order to support the limb, together with a contrivance, that would answer the views of Bertrandi, might be used, in cases, where assistants are not at hand, or instead of careless stupid assistants, by whom the bone is frequently splintered.

SECTION 3.

REMARKS ON THE AMPUTATION OF THE LEG, BY M. LOUIS.

Such authors, as have treated the most correctly of the amputation of the leg, have paid some attention to the particular disposition of the parts, which compose the limb. They have recommended the operation to be done below the tuberosity of the tibia, in order to avoid cutting the tendons of the muscles. They have determined, that the operator should place himself between the patient's legs, for the sake of sawing the bone with most ease; and they have given directions, how to employ the saw most advantageously. Such are nearly the particular objects, on which they have dwelt. A considerable reflection on the relative disposition of the parts, which enter into the formation of the leg, cannot fail to furnish room for more extensive remarks on this operation.

The absorption of the fat, the subsidence of the soft parts, and the diminution of the cellular substance, cause the skin to advance considerably over the stump in amputations of the arm and thigh; and

we have shewn, says M. Louis, that the integuments can never contribute to the inconveniences following those operations. But, this is not the case, with regard to the leg; here the skin is the immediate covering of a large surface of the principal bone. There are no soft parts interposed, the primitive retraction and subsidence of which can occasion the skin to project on the stump. The precept, therefore, to preserve as much of the integuments as possible essentially claims the surgeon's case in the amputation of this part. The precautions directed, on this account, consist in pulling the skin firmly towards the knee, and in adopting the double incision. The ancients observed the first of these rules; they were ignorant of the second; but, they obtained all its advantages by the position of the patient, and the attitude, in which the limb was put during the operation. We are in the habit of having the thigh and leg held horizontally. This posture is attended with obvious objections; for, after the operation, the thigh and stump are placed in a state of flexion, by which means, the skin is drawn up, and the end of the tibia is necessarily denuded.

Ambroise Paré wished, that "*la jambe fut un peu ployée pendant l'opération, et qu'on l'étendit ensuite, afin que les vaisseaux fussent plus saillans.*" This precaution appeared to him necessary, because he used to take up the vessels with forceps in order that they might be tied. Guillemeau carried his views further; he knew the advantage of bedding the leg, during amputation, in promoting the extension of the skin over the end of the bone after the operation. He directs, that the surgeon "*se mettra entre les jambes du malade, et commandera à un serviteur de relever le gontremont le plus qu'il pourra le cuir et les muscles situés en la partie qu'il conviendra extirper, ayant auparavant fait plier et fléchir ledit membre, tant fin de faire prolonger la peau, que les veines et les artères.*"

The reasons, why this useful position has been abandoned, are naturally obvious. The limb in amputating must be firmly held, and, when the thigh and leg are bent, it is extremely difficult for the assistants to fix the lower extremity. M. Louis says, it is surprising, that, among the successors of Paré and Guillemeau, not one should have paid attention to the advantages of the posture, which these celebrated men recommended, with a view of obviating inconveniences, which they had experienced.

M. Louis next speaks of an apparatus, by which the leg might be rendered sufficiently steady in the bent position to admit of the saw being used; but, the ob-

servations on this subject I have omitted. M. Louis, indeed, acknowledges, his conclusion, that the horizontal position will be always continued by practitioners. In this circumstance, says he, the precaution of drawing the skin up towards the knee will not suffice for the preservation of an adequate quantity. Hence, the double incision has been resorted to; i. e. the skin is first divided by a circular incision, an inch below the place, where it is intended to saw the bone, in order to be able to draw the integuments upward, and keep them there with a band, while the muscles are cut on a level with them. I have examined this mode of proceeding attentively, and, I am of opinion, that it admits of being shortened, so as to lessen the pain of the operation. The gastrocnemius and solæus muscles, which form the major part of the bulk of the leg, and are the only ones not adherent to the bone, retract as soon as divided. The skin, which is insusceptible of such retraction and is more extensible, will always project more than those muscles, even were the latter cut on the same line with the wound of the integuments. It follows from this consideration, that the operation by the double incision can only be commendable, on the ground of having a sufficient quantity of skin to cover that portion of the tibia, which is directly under the integuments; and thus, says M. Louis, the benefit, expected from the double incision, is limited to a part of the circumference of the member. But, this advantage may be obtained, by merely making, through the skin of the anterior part of the leg, a semicircular incision, reaching from the internal edge of the tibia to the outside of the fibula. In this method, the patient will be saved from the pain, that would arise from dividing the skin, so as to make the cut completely circular. This first cut may be made more or less advantageously. It has appeared to me, observes M. Louis, that the most proper plan is to draw the skin up, from a point sufficiently low down, and to fix it with a band, in such a way, that the incision, which is to be made above this band, will be an inch lower, than the place where the bone is to be sawn. The band, when applied with due tightness, will keep the skin from descending, and will aid in fixing the soft parts, above the part, where they are to be divided. The semicircular incision of the integuments having been made with a common scalpel, the skin must be drawn upward: there it is to be kept by means of another band; and then the section of the soft parts is to be completed, on a level with the skin, thus raised on the front of the limb.

In performing this second incision, it will be very useful to incline the edge of the knife obliquely upwards. By this means, the skin will be longer than the muscles, and the cure will be considerably accelerated, &c. After this incision, the flesh, betwixt the two bones, is to be divided, and, then, the periosteum, as usual.

It remains to saw the bones. Authors have given different advice on this subject. Some say, we should begin with the fibula, and end with the tibia; because, if we were to saw through the tibia first, the fibula, remaining alone, would hardly be able to bear the action of the saw, without great disturbance of the soft parts. Others, whose counsel is most listened to, recommend us to apply the saw to both bones, in such a manner, however, that we are to begin with dividing a part of the tibia, until the instrument has reached the fibula, when the two bones are to be sawn together. Thus, the tibia serves, as a support, while the fibula is divided, and the sawing ends with completing the section of the tibia. This practice seems very rational; but, it does not entirely prevent the moveableness of the fibula, which, unless care be taken, will move about under the saw, and even cause laceration of the muscles. In order to avoid this inconvenience, says M. Louis, I have always taken care to direct the assistants, who hold the limb, to press the fibula strongly against the tibia. This precaution, however, cannot be followed, when the bones are much broken, nor in cases of worm-eaten caries, and it is always less safe and commodious, than a plan, which, in these cases, is adopted by Bertrandi. As soon as this surgeon has divided the flesh, which is between the bones, before sawing them, he applies round them a strong narrow ligature. This cord brings the fibula nearer the tibia, and fixes it in a way, that materially facilitates the action of the saw. It is only by combining several little practices of decided utility, that we can expect to bring the operative part of surgery to perfection.

On the subject of Verduin's mode of amputating the leg so as to form a flap, M. Louis observes, that the operation is far more painful, than that which is ordinarily performed, and Verduin is candid enough to believe this, rather than the modern panegyrists of his method. Verduin states positively, that it is cruel and embarrassing; but, carried away, as he was, with the ambition of being praised, as the inventor of a new practice (of which, by the by, not he, but Loudham was,) his seduced imagination made him see unreal

advantages in this method, and blinded him, in respect to its defects. In speaking of a young man, on whom this operation was successfully performed, Verduin states, that he walks and bends his knee so freely, that it is hard to say, which leg is of the most use to him. Such an exaggeration, observes M. Louis, is not unusual with an author, whose foible is to insist on the merit of his own invention. But, it is very singular, that a modern writer, the only one, who has bestowed unqualified praise on this method, should have alleged, in the most extravagant strain of prejudice, that officers, on whom this operation have been done, have been seen dancing and jumping, just as if they had real legs. Such gratuitous assertions, says M. Louis, are not to be believed; they are the effect of immoderate admiration, and can deceive nobody.

I shall pass over what M. Louis urges against Verduin's pretension to effect a cure by apposition of the parts, without suppuration.

It was alleged, that they, on whom the flap amputation of the leg had been performed, suffered no sympathetic pain in the limb. Verduin thought, that this was proved by an example, in which a man had had his leg cut off at sea. He felt severe and grievous pains, seeming as if they were in the amputated foot. As the stump was too long, part was amputated by the new method, and the shootings and pains, formerly experienced, were no longer felt. Celsus, observes M. Louis, would not have approved this second operation; but, would have considered it as superfluous: *Stultum est decoris causâ rursum et dolorem et medicinam sustinere, lib. 5. cap. 26.* Had Verduin been offering his opinion on the invention of another, he would have perceived reasons in explanation of the pains being relieved; and, no doubt, he would not, for want of such reasons, have argued, that a solitary fact was sufficient to establish a general consequence. Indeed, about five years after Verduin's dissertation was published, the famous Ruysch assisted at an operation, performed according to this new method; it succeeded; but, the patient was not exempt from the sympathetic pains. Besides, there is no reason authorising the supposition, that such an advantage would result from this manner of operating.

Another point, adverted to by M. Louis, is the moveableness of the stump. The panegyrists of this method have regarded the preservation of the motion of the knee, as an advantage exclusively belonging to this operation. But, Verduin positively states, that the motion of the knee continues free, if care be taken to move it,

from time to time, during the treatment. Would not the same thing happen, after the common operation, with the same precaution? The saving of a flap cannot at all promote the motion of the stump, since the use of the muscles, which compose such flap, is to move the foot. The motion of the stump depends upon the action of muscles, which are situated in the thigh, and which are inserted into the leg, above the place, where the amputation is performed. The motion of the knee may, therefore, be preserved after the ordinary operation; and it is not an advantage particularly arising from the flap amputation, as has been asserted, through inattention to the mechanical arrangement, and the use of the parts.

With regard to the utility, alleged to proceed from the flap serving as a cushion to the bone, so that the patient bear on the end of the stump, without any inconvenience, or pain, M. Louis remarks, that he knows not, whether the portion of flesh, that grows in its new situation, is of a nature to sustain, without any ill effects, the weight of the body, under narrow surfaces, and a substance, as hard as the ends of the bones; but, that, to facilitate progression with an artificial leg, which imitates the natural one, there is no occasion for the weight of the body to bear on the end of the stump. The size of the upper part of the tibia allows a machine to be adapted, that will afford, under the head of this bone, a circular point of support, on which the weight of the body may be sustained.

M. Louis argues, that nearly all the partisans of the flap operation, before the time, when he wrote, had only extolled it speculatively. Garengot was the only one that had practised it. It is a reflection against the real superiority of this method, that it has been relinquished in the very country, where it was first received as an important discovery, and where it had been originally practised with success, by surgeons of skill and reputation. Good things, adopted by several persons at once, in different parts, do not usually fall into disrepute, especially, if pains be taken to cultivate the art, and keep it from declining. Had the flap amputation possessed all the advantages, that were ascribed to it, it would not so soon have been abandoned. Objections to the plan must also have conduced to its declension. M. Louis then adverts to the probability, that abscesses frequently formed in the stump, when any part of the flap did not unite; and he concludes with observing, that if the retraction of the muscles, composing the flap, prevented the bone being covered, all the alleged

benefit of the plan was lost. This might the more easily happen in the leg, inasmuch as the bones were at the circumference of the wound, and the largest surface, which they presented, was exactly at that point of the circumference, which was opposite the base of the flap, towards which the retraction must have taken place. In relating the inconveniences and objections, which present themselves to me (says M. Louis,) I do not mean to deny the facts in testimony of the success of the operation; the object of the discussion is to ascertain, if this plan is preferable to the other.

SECTION 4.

REMARKS ON THE AMPUTATION OF THE FORE-ARM, BY M. LOUIS.

Of all the amputations which I have seen, that of the forearm most frequently proves unsuccessful. From the middle to the lower end of this part of the limb, the member is composed of numerous tendons; and amputation, done at any point of this extent, leaves the bone denuded, and the cure is tedious and painful.

Towards the upper part of the forearm, the radius and ulna are sufficiently covered with muscles, which never leave the bone denuded, because they are adherent to it, and are bound down by strong aponeuroses. These tendinous expansions even pass into the interstices of the muscles, and furnish these organs with particular sheaths, serving to confine them in their proper direction. The knowledge of this structure of the parts will indicate to us certain rules of conduct, which will contribute to the perfection and success of our operations.

The preliminary division of the skin, which we have rejected as useless in some cases of amputation, is essentially proper in that of the forearm. The adhesion of the muscles, and the way, in which they are fixed in their direction, make it necessary to save as much skin as possible, in order that this may extend to the edge of the divided muscles. In order to make this first cut advantageously, continues M. Louis, the inferior ligature should first be put round the limb, with the precautions, which have been explained in speaking of the amputation of the leg. While an assistant draws the skin upward, as much as possible, in embracing the whole circumference of the limb with both his hands, the operator is to apply the ligature at least an inch lower than the place, where he designs to saw the bones. He is then to make a circular incision, above this ligature, the assistant observing at

the same time to pull the skin towards the elbow joint. The upper ligature is next to be applied with a view of fixing the soft parts, and the skin that is drawn up, and the muscles are to be divided on a level with it, in the ordinary way.

For making these incisions, says M. Louis, the curved knife does not appear to me so convenient, as a bistoury with a slightly convex edge; for, the forearm is not round, its figure being that of an oval, flattened on the inside. When the muscles and periosteum have been completely divided, the bones are to be sawn. The limb is usually put in a state of pronation, the surgeon standing on the inner side. The saw is to be applied horizontally, in such a manner, that the bones may be cut at once, beginning, however, with the ulna. The radius, every body knows, is exceedingly moveable, and is much more difficult to fix, than the fibula. M. Louis, therefore, conceived, that it might be an useful precaution, to tie the two bones of the forearm together with a ligature, as Bertrandi used to do, with respect to those of the leg. (See *Mémoires de l'Acad. de Chirurgie*, Tom. 5. Edit. in 12mo.)

The following sources of instruction, on the subject of amputation, are particularly entitled to notice: *Celsus de Re Medicâ. Œuvres de Paré*, livre 12, chap. 30 and 33. *Sharp's Operations of Surgery*, chap. 37. *Sharp's Critical Enquiry into the present State of Surgery*, chap. 8. *Ravaton's Traité des Plaies d'Armes à Feu*. *Bertrand's Traité des Opérations de Chirurgie*, chap. 23. *Le Dran's Traité des Opérations de Chirurgie*. *Heister's Instit. Chirurg.* Pars 2. Sect. 1. *Young's Currus Triumphalis e Terebinthinâ*, Londini 1679. *Nouvelle Méthode pour faire l'opération de l'Amputation dans l'Articulation du Bras avec l'Omoplate* par M. la Faye. *Histoire de l'Amputation, suivant la Méthode de Verduin et Sabourin, avec la Description d'un nouvel instrument pour cette Opération*, par M. la Faye. *Moyens de rendre plus simple et plus sûre l'Amputation à Lambeau*, par M. de Garregeot. *Observation sur la Resection de l'Os, après l'Amputation de la Cuisse*, by M. Veyret. *Mémoire sur la Saillie de l'Os après l'Amputation des Membres; ou l'on examine les causes de cet inconvénient, les moyens d'y remédier, et ceux de la prévenir*, par M. Louis. *Second Mémoire sur l'Amputation des Grandes Extrémités*, par M. Louis. *The foregoing Essays are in Mém. de l'Acad. de Chirurgie*, Tom. 5. Edit. 12mo. *Essai sur les Amputations dans les Articulations*, par M. Brasdor, in Tom. 15. of the same work. *Bilguer on the Inutility of Amputation*. *White's Cases in Surgery*. *Bromfield's Chirurgicall Observations and Cases*, Vol. 1. chap. 2. *O'Hullorvan's Treatise on Gangrene, &c. with a new*

method of Amputation. *Alanson's Practical Observations on Amputation*. *Pott's Remarks on Amputation*. *Sabatier's Médecine Opératoire*, Tom. 3. *Hey's Practical Observations in Surgery*, Edit. 2. *Remarques et Observations sur l'Amputation des Membres*, in *Œuvres, Chir. de Desault* par Bichat, Tom. 2. *Encyclopédie Méthodique, Partie Chirurgicale*, Tom. 1. art. *Amputation*. *Rees' Cyclopædia*, art. *Amputation*. *Vermischte Chirurgische Schriften, von J. L. Schmucker*, Band. 1. *John Bell's Principles of Surgery*. *Cases of the Excision of carious Joints*, by Park and Moreau, published by Dr. Jeffray. *Operative Surgery*, by C. Bell, Vol. 1. *Richter's Anfangsgründeder Wundarzneykunst*, Band 7. *Richerand's Nosographie Chirurgicale*, Tom. 4, Edit. 2. *B. Bell's Surgery*, Vol. 5. *Mémoire sur l'Amputation des Membres*, in *Pelletan's Clinique Chirurgicale*, Tom. 3. *Gooch's Chirurgicall Works*—various parts of the three volumes. *Larrey's Relation Chirurgicale de l'Armée d'Orient en Egypte et Syrie*. *Petit's Traité des Maladies Chirurgicales*, *Guthrie on Gun-shot wounds, &c.*

AMYGDALÆ. The tonsils, so termed from their resemblance to almonds. (See *Tonsils*.)

AMYLUM. Starch. The word is derived from *aneg.* and *μύλη*, a mill, because starch was formerly made of corn, without being ground in a mill. Powdered starch is sometimes used as an external application to erysipelas; but, chiefly, in gylsters, when the neck of the bladder is affected with spasm. The following is the formula used at St. Bartholomew's Hospital. *ꝛ Mucilaginis Amyli, Aquæ distillatæ*, sing. *℥ij Tinct. Opii guttas quadraginta*: *Misce.*

ANASARCA, (from *ανα*, through, and *σαρξ*, flesh.) A dropsical disease, in which an aqueous fluid is extensively diffused in the general cellular texture of the body. When less extensive, the complaint is termed, *œdema*, which then becomes a surgical case, unless entirely dependent on constitutional causes.

ANASTOMOSIS, (from *ανα*, through, and *στομα* a mouth.) *Inosculatio*. Anatomists and surgeons imply, by this term, the communications of the blood vessels with each other, or their running and opening into each other, by which the continuance of a free circulation of the blood is greatly insured. The immense importance of this part of our structure, in all cases in which the main artery, or vein of a limb, is rendered impervious, is particularly conspicuous in aneurisms. (See *Aneurism*.)

ANATRESIS, (from *ανα*, and *τιτραω*, to

perforate.) Galen signifies, by this term, the operation of trepanning.

ANCHYLOBLEPHARON. A concretion of the eyelids; a closure of them.

ANCHYLOGLOSSUM. An accretion of the tongue to the adjacent parts; also being tongue-tied. (See *Frenum Linguae*.)

ANCHYLOMERISMA. A growing together of the soft parts.

ANCHYLOPS, (from *αγχι*, near, and *οφθαλμος*, the eye.) Same as *Ægylops*.

ANCHYLOSIS, (from *αγκυλος*, crooked.) This denotes intimate union of two bones, which were naturally connected by a moveable kind of joint. All joints originally designed for motion, may become ankylosed, that is, the heads of the bones, forming them, may become so consolidated together, that no degree of motion whatever can take place. Bernard Conner (*De stupendo ossium coalitu*) describes an instance of a general ankylosis of all the bones of the human body. A still more curious fact is mentioned in the *Hist. of the Acad. of Sciences*, 1716, of a child 23 months old, affected with an universal ankylosis. In the advanced periods of life, ankylosis more readily occurs, than in the earlier parts of it. The author of the article *ankylosis* in the *Encyclopédie Méthodique*, mentions his having preserved a specimen, in which the femur is so ankylosed with the tibia and patella, that both the compact and spongy substance of these bones appears to be common to them all, without the least perceptible line of separation between them. In old subjects, the same kind of union is commonly observable between the vertebrae, and between these and the heads of the ribs.

The greater, or lesser degree of immobility, has caused ankylosis to be distinguished into the *true* and *false*. In the true ankylosis, the bones have grown together so completely, that not the smallest degree of motion can take place, and the case is positively incurable. The position, in which the joint has become thus inalterably ankylosed, makes a material difference in the inconvenience resulting from the occurrence. The false ankylosis is that, in which the bones have not completely grown together, so that their motion is only diminished, not destroyed. The true ankylosis is sometimes termed *complete*; the false, *incomplete*.

In young subjects in particular, ankylosis is seldom an original affection, but generally the consequence of some other disease. It very often occurs after fractures, in the vicinity of joints; after sprains, and dislocations attended with a great deal of contusion; and after white swell-

ings and abscesses in joints. **Aneurisms**, and swellings and abscesses on the outside of a joint, may also induce ankylosis. In short, every thing which keeps a joint long motionless, may give rise to the affection, which is generally the more complete the longer such causes have operated.

When a bone is fractured near a joint, the limb is kept motionless by the apparatus, during the whole time requisite for uniting the bones. The subsequent inflammation also extends to the articulation, and attacks the ligaments and surrounding parts. Sometimes, these only become more thickened and rigid; on other occasions the inflammation produces a mutual adhesion of the articular surfaces. Hence fractures so situated, are more serious than when they occur at the middle part of a bone. But, it is to be noticed, that all fractures leave, after their cure, a certain degree of stiffness in the adjacent joints; but, this arises from the inactivity, in which the muscles and articular surfaces have been, and may generally be cured by gradually exercising, and increasing the motion of the limb.

The position of an ankylosed limb is a thing of great importance. When abscesses form near the joint of the fingers, and the tendons mortify, the fingers should be bent, that they may ankylose in that position, which renders the hand much more useful, than if the fingers were permanently extended. The knee, on the contrary, should always be kept as straight as possible, when there is danger of ankylosis. The same plan is to be pursued, when the head of the thigh bone is dislocated in consequence of a diseased hip. When the elbow cannot be prevented from becoming ankylosed, the joint should always be kept bent. No attempt should ever be made to *cure*, though every possible exertion should often be made to *prevent*, a true ankylosis. The attempt to prevent, however, is not always proper, for many diseases of joints may be said to terminate, when ankylosis occurs.

When the false, or incomplete ankylosis is apprehended, measures should be taken to avert it. The limb is to be moved as much as the state of the soft parts will allow. Boyer remarks, that this precaution, is much more necessary in affections of the ginglymoid articulations, than of the orbicular ones, on account of the tendency of the former to become ankylosed, by reason of the great extent of their surfaces, the number of their ligaments, and the naturally limited degree of their motion.

The exercise of the joint promotes the

secretion of the synovia, and the grating first perceived in consequence of the deficiency of this fluid, soon causes. A certain caution is necessary in moving the limb: too violent motion might create pain, swelling, and inflammation, and even carries of the heads of the bones. It is by proportioning it to the state of the limb, and increasing its extent daily, as the soft parts yield and grow supple, that good effects may be derived from it. (See *Boyer Mal. des Os. Tom. 2.*) The use of embrocations, and pumping cold water on the joint, every morning, have great power in removing the stiffness of a limb remaining after the cure of fractures, dislocations, &c.

Unreduced dislocations are not always followed by ankylosis. Nature often forms a new joint, especially in persons of the lower order, who are obliged to move their limbs a great deal, in order to obtain a livelihood. The surrounding cellular substance becomes condensed, so as to form, around the head of the luxated bone, a membrane serving the purpose of a capsular ligament. The muscles, at first impeded in their action, become so habituated to their new state, that they resume their functions. This is particularly the case with bones which move in every direction, and have round heads; but, in ginglymoid joints, the heads of the bones are only imperfectly dislocated, and the motion is greatly restrained by the extent of surface; while some of the numerous ligaments are only sprained, not ruptured. These causes promote the occurrence of ankylosis.

Ankylosis may follow contusions of the joints, and such shocks, as the articular surfaces experience in leaping, or falling on the feet, from great heights. This is more likely to happen, when the inflammatory symptoms, resulting from such violence, have not been properly counteracted by bleeding, and other general remedies. Sprains, which violently twist the joints, very often, on this account, cause an ankylosis, especially, when the inflammation has long hindered such joints from being at all moved.

When diseases of joints end in a complete ankylosis, the occurrence is to be looked upon, as a very favourable one. In fact, it is as much a means of cure, as the formation of callus is for the union of broken bones. The disease of the vertebrae, described by Pott, is cured, as soon as the bones ankylose, nor can the patient be considered well, before this event has taken place. See on this subject *l'Encyclopédie Méthodique, Partie Chirurgicale, Tom. 1. art. Ankylose. Boyer sur les Mal. des Os. Tom. 2. Richter's Nosographie Chirurgicale, Tom. 3, p. 238, edit. 2.*

ANEURISM, or ANEURISM, (from *aneurysma*, to dilate.) The tumours which are formed by a preternatural dilatation of a part of an artery, as well as those swellings, which are occasioned by a collection of arterial blood, effused in the cellular membrane, in consequence of the rupture, or opening of the coats of the artery, receive the name of aneurisms. According to the common opinion, then, aneurisms are of two kinds; the first being termed *true*; the second, *spurious*, or *false*. Some writers admit a third species, which is said to happen, when, in consequence of the external coats of the artery having been divided, the internal tunics are protruded, much in the same manner as the peritoneum is by the intestines, or omentum, in cases of hernia. This imaginary case has been denominated the *mixed* aneurism. *Aneurisma herniam arterie sistens*. It was no less celebrated a man, than Dr. William Hunter, who first supposed, that a disease, like the last, might proceed from the outer coats of an artery being cut, and the inner ones becoming consequently dilated. But, the experiments of Hunter and Home, as I shall have occasion to mention again, fully prove, that an aneurism will not arise from the kind of weakness, which cutting, or even stripping off, the external coat of an artery must produce; and Scarpa, as I shall presently notice, satisfactorily shews, that, in all common aneurisms, the internal coats of the affected artery are invariably ruptured or wounded.

It deserves attention, however, that, by the term *mixed* aneurism, Dr. Alexander Monro implied the state of a true aneurism, when its cyst has burst, and the blood has become diffused in the adjacent cellular substance. This event is certainly a real one; but, Dr. Hunter's case may be deemed altogether supposititious. Besides these common divisions of aneurism, there are two other kinds, one named the *aneurismal varix*, or *venous aneurism*; the other called by Mr. John Bell, the *aneurism from anastomosis*; the particulars of both which cases will be offered in due time.

Before the time of Galen, the diseases, now known by the name of aneurisms, do not appear to have been noticed. It was the doctrine of this physician, that such swellings were produced either by anastomosis, or by rupture, and he has described their symptoms, without informing us, however, of the characters by which each of these cases was distinguishable, one from the other. Paulus Ægineta endeavoured to give a more particular account of the diagnosis, and he has detailed different modes of operating, applicable to the various cases of the disease

The sentiments of these writers was adopted by all their successors down to Ferrius, who declared, that every aneurismal tumour was occasioned by a dilatation of the coats of the arteries. This opinion has been almost universally adopted by the moderns, and, until the late publication of Scarpa, few surgeons entertained a suspicion, that a doctrine, so positively taught in the schools, could possibly be erroneous. Even the learned Sabatier says, there can be no doubt, that many aneurisms depend upon the dilatation of the arterial coats; but, continues he, when this happens, the cases present remarkable differences. Sometimes the three arterial tunics are dilated all together. In other instances, only the two internal coats are affected with dilatation. *While, in more numerous examples, the internal tunics are ruptured, and it is the cellular coat alone, which separates from them, and enlarges, so as to form the aneurismal sac; de sorte que les artères, qui sont dans ce cas, sont diloriquées, suivant l'expression de Lancisi.*

It is difficult to conceive, observes Sabatier, how all the coats of an artery can dilate and yield sufficiently to form the investment of such immense tumours as some aneurisms are. Indeed, that very tunic, which composes the greater part of the thickness of the vessel, and which is termed the *muscular coat*, is known to consist of fibres, whose texture is firm, and little capable of bearing extension. However, Sabatier states, that there are some observations, which prove, that the muscular tunic may become dilated as well as the others. Haller, in describing a very large aneurism, situated in the aorta near the heart, relates, that the innermost coat of this vessel, was ruptured and torn, the loose jagged edges of the laceration being visible in the aneurismal sac. These were squamous, bony, and of little thickness; while the muscular and cellular coats were quite sound. Donald Monro noticed the same thing in five different aneurisms, which occurred in the course of the femoral and popliteal arteries of a man, who had been confined a long while to his bed, after submitting to the operation for the bubonocoele. Monro succeeded in tracing the fibres of the muscular coat over these swellings, so that he had no doubt of this tunic being dilated. Sabatier thinks, that it is not to be inferred, that all such writers, as have related the histories of true aneurisms, proceeding from a dilatation of all the arterial coats, can have been mistaken, although they have not minutely described the texture of the sac, in which the blood was contained. Yet, possibly, adds the same judicious writer, most of these aneu-

risms may have been of a similar kind to those, which result from the rupture of the internal tunics of the arteries, and the dilatation of the cellular coat; for, in such tumour, the fragments of the lacerated coats are often blended with osseous, steatomatous, or purulent matter, and confounded with the cellular coat, that forms the exterior investment. (See *Médecine Opératoire*, Tom. 3. p. 160—162.)

We find then from the foregoing observations, that Sabatier was much disposed to consider the true aneurism, or that supposed to be formed by a dilatation of all the arterial tunics, as, by no means a case, that is of usual occurrence, or that has been satisfactorily demonstrated. This eminent surgeon, I think, is the first modern author, who has shewn a propensity to doubt the notion, so generally entertained at the present day, concerning the actual dilatation of all the coats of the artery in cases of true aneurism; and this remark is the more deserving of notice, in consequence of the opinions lately professed by Scarpa, on the point in question. The latter writer, we shall presently see, sides entirely with the ancients on this subject, and, as he is unsurpassed in minute anatomical investigations, and in accuracy of observation, his sentiment cannot fail to have great weight in the matter. Previously, however, to offering an account of his opinions, concerning the formation of aneurisms, it seems proper to make the reader acquainted with the various species of the disease, their ordinary symptoms, and a few other circumstances, as usually explained by surgical writers.

When any part of an artery has the appearance of being dilated, the swelling is commonly named a *true*, or *genuine aneurism*. In such cases, the artery either seems only enlarged at a small part of its track, and the tumour has a determinate border, or, the vessel seems dilated, for a considerable length, in which circumstance, the swelling is oblong, and loses itself so gradually in the surrounding parts, that its margin cannot be exactly ascertained. The first case, which is the most common, is termed the *circumscribed true aneurism*; the last, the *diffused true aneurism*. When blood escapes from a wound, or rupture, of an artery, into the adjoining cellular substance, the swelling occasioned is denominated the *spurious*, or *false aneurism*. In this instance, the blood either collects in one mass, distends the cellular substance, and condenses it into a cyst, so as to form a distinctly circumscribed tumour; or it is injected into all the cavities of the surrounding cellular substance, and extends along the

course of the great vessels, from one end of the limb to the other, thus producing an irregular, oblong swelling. The first case is named, the *circumscribed false aneurism*; the second, the *diffused false aneurism*. (*Richter's Anfangsgr. Bund. 1.*)

Mixed aneurism was the name given by Dr. W. Hunter to one which he supposed might proceed from the outer coats of an artery being cut, and the inner ones becoming consequently dilated. But, the experiments of Hunter and Home, as we shall have occasion to mention again, fully prove, that an aneurism will not arise from the kind of weakness which cutting, or even stripping off, the external coat of an artery, must produce; and Scarpa, as we shall presently notice, satisfactorily shews that the internal coats are always ruptured. By the *mixed aneurism*, Dr. Monro implied, the state of a true aneurism, when its cyst has burst, and the blood has become diffused in the adjacent cellular substance. This event is certainly a real one, but, Dr. Hunter's case may be deemed altogether suppositions.

The symptoms of the circumscribed true aneurism take place as follows: the first thing the patient perceives is an extraordinary throbbing in some particular situation, and, on paying a little more attention, he discovers there a small pulsating tumour, which entirely disappears, when compressed, but, returns again as soon as the pressure is removed. It is commonly unattended with pain, or change in the colour of the skin. When once the tumour has originated, it continually grows larger, and, at length, attains a very considerable size. In proportion as it becomes larger, its pulsation becomes weaker, and, indeed, it is almost quite lost, when the disease has acquired much magnitude. The diminution of the pulsation has been ascribed to the coats of the artery losing their dilatable and elastic quality, in proportion as they are distended and indurated, and, consequently, the aneurismal sac being no longer capable of an alternate diastole and systole from the action of the heart. The fact is also imputed to the coagulated blood, deposited on the inner surface of the sac, particularly, in large aneurisms, in which some of the blood is always interrupted in its motion. In true aneurisms, however, the blood does not coagulate so soon, nor so often, as in false ones. Immediately, such coagulated blood lodges in the sac, pressure can only produce a partial disappearance of the swelling. In proportion as the aneurismal sac grows larger, the communication of blood into the artery beyond the tu-

mour is lessened. Hence, in this state, the pulse, below the swelling, becomes weak and small, and the limb frequently cold, and œdematous. On dissection, the lower continuation of the artery is found preternaturally small and contracted. The pressure of the tumour on the adjacent parts also produces a variety of symptoms, ulceration, caries, &c. Sometimes, an accidental contusion, or concussion, may detach a piece of coagulum from the inner surface of the cyst, and the circulation through the sac be obstructed by it. The coagulum may possibly be impelled quite into the artery below, so as to induce important changes. The danger of an aneurism arrives when it is on the point of bursting, by which occurrence the patient usually bleeds to death, and this sometimes in a few seconds. The fatal event may generally be foreseen, as the part about to give way becomes particularly tense, elevated, thin, soft, and of a dark purple colour. (*Richter's Anfangsgr. Bund. 1.*)

A large axillary aneurism, which burst in St. Bartholomew's Hospital, a few years ago, did not burst by ulceration, but by the detachment of a small slough from a conical, discoloured part of the tumour. Since this case fell under my observation, I have had an opportunity of seeing the process, by which an inguinal aneurism burst: at a certain point, the tumour became more conical, thin, and inflamed, and here a slough, about an inch in width was formed. On the dead part becoming loose, a profuse bleeding began. We are then to conclude, that external aneurisms do not burst by ulceration, but, by the formation and detachment of a slough.

The *false aneurism* is always owing to an aperture in the artery, from which the blood gushes into the cellular substance. The case may arise from an artery being lacerated in violent exertions; but, the most common occasional cause is a wound. This is particularly apt to occur at the bend of the arm, where the artery is exposed to be injured in attempting to bleed. (For this case see *Hæmorrhage*.) In this circumstance, as soon as the puncture has been made, the blood gushes out with unusual force, and in a bright scarlet, irregular, interrupted current. It flows out, however, in an even, and less rapid stream, when pressure is applied higher up than the wound. These last are the most decisive marks of the artery being opened; for blood often flows from a vein with great rapidity, and in a broken current, when the vessel is very turgid, and situated immediately over the artery, which imparts its motion to it. The sur-

geon endeavours precipitately to stop the hemorrhage by pressure, and he commonly occasions a *diffused false aneurism*. The external wound in the skin is closed, so that the blood cannot escape from it; but, hence, it insinuates itself into the cellular substance. The swelling, thus produced, is uneven, often knotty, and extends upward and downward along the track of the vessel. The skin is also usually of a dark purple colour. Its size increases, as long as the internal hemorrhage continues, and, if this should proceed above a certain pitch, mortification of the limb ensues.

The *circumscribed false aneurism* arises in the following manner. When proper pressure has been made in the first instance, so as to suppress the hemorrhage; but, the bandage has afterwards been removed too soon, or before the artery has healed, the blood passes through the unclosed wound, or that which it has burst open again, into the cellular substance. As this has now become agglutinated by the preceding pressure, the blood cannot diffuse itself into its cells, and, consequently, a mass of it collects in the vicinity of the aperture of the artery, and distends the cellular substance into a sac. Sometimes, though not often, this circumscribed false aneurism, originates immediately after the opening is made in the artery. This chiefly happens when the aperture in the vessel is exceedingly small, and, consequently, the hemorrhage takes place so slowly, that the blood, which is first effused, coagulates, and prevents the entrance of that which follows into the cavities of the cellular substance, and, of course, its diffusion. A membrane, aponeurosis, &c. may also be just over the orifice, so as to prevent the aneurism from being diffused.

The circumscribed false aneurism consists of a sac, composed of cellular substance, filled with blood, and situated close to the artery, with which it has a communication. At every pulsation, fresh blood gushes from the opening of the artery into the sac, and distends it; but, its elasticity then makes it contract a little, and urge a portion of the blood back into the vessel. Hence, in false aneurisms, a throbbing is always perceptible, and is more manifest, the smaller such tumours are. The larger the sac becomes, the less elastic it is, and the greater is the quantity of coagulated blood in it; so that in very large aneurisms of this kind, the pulsation is sometimes wholly lost.

The tumour is at first small, and on compression entirely disappears; but, returns as soon as this is removed. It also

diminishes, when the artery above it is compressed; but, resumes its wonted magnitude, immediately such pressure is discontinued. When there is coagulated blood in the sac, pressure is no longer capable of producing a total disappearance of the tumour, which is now hard. The swelling is not painful, and the integuments are not changed in colour. It continually increases in size, and, at length, attains a prodigious magnitude.

The following are generally enumerated, as the discriminating differences between circumscribed true and false aneurisms: the true aneurism readily yields to pressure, and as readily recurs on its removal; the false one yields very gradually, and returns in the same way, as the blood in the sac can only pass and repass slowly through the aperture in the artery. Frequently, a hissing sound is very audible, when the blood gushes into the sac. The pulsation of the false aneurism is always more feeble, and, as the tumour enlarges, is sooner lost, than that of the true one, which even throbs after it has acquired a very considerable volume. The sac of the true aneurism is the artery itself; that of the false one is cellular substance. (See *Richter's Anfangsgr. Band. 1.*) Besides these common divisions of aneurism, there are two other kinds, one named the *aneurismal varix*, or *venous aneurism*, the other called by Mr. J. Bell, the *aneurism from anastomosis*; the particulars of both of which will be presently explained.

If the doctrines, however, of Professor Scarpa, of Pavia, which were published in 1804, are correct, the grand distinction of aneurism into *true* and *false* must be rejected, as erroneous: "for," says he, "after a very considerable number of investigations, instituted on the bodies of those, who have died of internal, or external aneurisms, I have ascertained, in the most certain and unequivocal manner, that there is only one kind, or form of this disease; viz. that caused by a solution of continuity, or rupture of the proper coats of the artery, with effusion of blood into the surrounding cellular substance; which solution of continuity is occasioned sometimes by a wound, a steatomatous, earthy degeneration, a corroding ulcer, a rupture of the proper coats of the artery, I mean the internal and muscular, without the concurrence of a preternatural dilatation of these coats being essential to the formation of this disease; and, therefore, that every aneurism, whether it be internal, or external, circumscribed, or diffused, is always formed by effusion." *Treatise on Aneurism by A. Scarpa, Trans. by Wishart.*

Preface. If this opinion be true, the difference in the symptoms of aneurisms above related, is to be imputed to the difference in the degree of rupture, diffusion, &c.

[In the first volume of the Philadelphia Medical Museum, a case of varicose aneurism is described, different from all those which have been mentioned. Dr. Physick has illustrated his account of the case, with an engraving from which it appears, that the aneurismal sac was formed of cellular membrane, and situated between the vein and artery, communicating freely with both.

A case somewhat similar is described by Mr. Park in the 4th vol. of Medical Facts and Observations, both these cases are also recorded in Wishart's translation of Scarpa on aneurism.]

Scarpa observes, that it is an error to suppose, that the aneurism at the curvature, or in the trunk, of the aorta, produced by a violent and sudden exertion of the whole body, or of the heart in particular, and preceded by a congenital relaxation of a certain portion of this artery, or a morbid weakness of its coats, ought always to be considered, as a tumour formed by the distention, or dilatation of the proper coats of the artery itself, that is, of its internal and fibrous coats. Scarpa considers it quite demonstrable, that such aneurisms are produced by a corrosion and rupture of these tunics, and, consequently, by the effusion of arterial blood under the cellular sheath, or other membrane, covering the vessel. If ever there be a certain degree of preceding dilatation, it is not essential to constitute the disease; for it is not a constant occurrence, most aneurisms are unpreceded by it, and, in those rare cases, in which the aneurism is preceded and accompanied by a certain degree of dilatation of the whole diameter of the curvature of the aorta, there is an evident difference between an artery simply enlarged in diameter, and the capsule, which forms the aneurismal sac.

Dissections, carefully conducted, will shew, that the aorta contributes nothing to the formation of the aneurismal sac, and that this is merely the cellular membrane, which, in the sound state, covered the artery, or that soft cellular sheath, which the artery received in common with the neighbouring parts. This is raised by the blood into the form of a tumour, and is covered, in common with the artery, by a smooth membrane.

The Italian professor does not deny, that, from congenital relaxation, the proper coats or the aorta may not occasionally yield and become disposed to rup-

ture; but he will not admit, that dilatation of this artery precedes and accompanies all its aneurisms, or that its proper coats ever yield so much to distention, as to form the aneurismal sac. The root of an aneurism of the aorta never includes the whole circumference of the artery; but, the aneurismal sac arises from one side in the form of an appendix, or tuberosity. On the contrary, the dilatation of the artery always occurs in its whole circumference, and, therefore, differs essentially from aneurism. Thus, there is really a remarkable difference between a dilated and an aneurismatic artery, although these two affections are sometimes found combined together, especially, at the origin of the aorta. If we also consider, that the dilatation of an artery may exist, without any organic affection, the blood being always in the cavity of the vessel; that in an artery so affected, there is never collected any grumous blood, or polypous layers; that the dilatation never forms a tumour of considerable bulk, and, that, while the continuity of the proper coats remain uninterrupted, the circulation of the blood is not at all, or not so sensibly changed, we shall be obliged to allow that aneurism differs essentially from the dilatation of an artery.

Galen, Cælius, Paulus, Actuarius, Haly, Albucasis, Oribasius, and Avicenna, who only treat of external aneurisms, speak of no other cases, than those by *effusion*; and, although some of these writers introduce the distinction, that external aneurisms are produced in three ways, viz. by *anastomosis*, by *diapedesis*, and by *diuresis*, they all affirm, that external aneurisms are invariably formed by the extravasation of blood under the skin. By *dilatation*, the Greek and Arabian physicians did not mean the expansion of the proper coats of the diseased artery; but, that tumour which the effused and coagulated arterial blood forms in the cellular membrane under the skin. Thus Cælius: *oritur dilatatio, aut dum sanguis, et spiritus ex arteriis prosultant; aut dum oscula ipsorum aperiuntur, aut dum rumpuntur. Sanguis autem et spiritus paulatim excreti sub cute colliguntur.* See also additional quotations in Scarpa from Actuarius, Silvaticus, &c.

Fernelius first published the theory of the dilatation of the coats of the arteries, as the proximate cause of aneurisms, particularly, internal ones, arising from no evident causes. The theory of Fernelius, however, instead of being deduced from observations on the dead subject, was only the result of his own imagination, and false conjectures, that effused arterial

blood would immediately putrify, and could never form, out of the vessels, a pulsating tumour. Sennertus, Hildanus, Barbette, and several others, rejected this theory, and were all convinced, that both internal and external aneurisms were formed by the rupture, and not by the dilatation of the internal coats of the artery.

Scarpa endeavours to demonstrate, by accurate dissections of arteries both in the sound and morbid state, what share the proper and constituent coats of the artery have in the formation of the aneurismal sac, and what belongs to the cellular covering, and other adventitious membranes surrounding the artery.

The covering of an artery is merely an adventitious sheath, which the vessels receive in common with the parts in the vicinity of which it runs. On cutting an artery across in its natural situation, the segment of the cut vessel retirés and conceals itself in this sheath.

This cellular covering is most evident round the curvature and trunk of the aorta, the carotid, mesenteric, and renal arteries; it is less dense round the trunk of the brachial, femoral, and popliteal arteries. The pleura lies over the cellular sheath of the arch of the aorta, and over that of the thoracic aorta; and that of the abdominal aorta is covered by the peritoneum. Both these smooth membranes adhere to, and surround, two-thirds of the circumference of the vessel. The great arteries of the extremities are not covered, in addition to the cellular substance, by any smooth membrane of this sort, but by a cellular sheath, which is demonstrably distinct from the adipose membrane, and serves to inclose the vessels, and connect them with the contiguous parts.

When air, or any other fluid, is injected by a small hole made artificially, between the cellular covering, and the subjacent muscular coat of the artery, the injected matter elevates into a tumour the cellular membrane, which closely embraces the artery, without properly destroying its cells, which it distends in a remarkable manner. When melted wax is injected, and pushed with much force, the cellular sheath of the artery is not only raised over the vessel, like a tumour, but, the internal cells of that covering, are also lacerated, and, on examining afterwards the capsule of the artificial tumour, it appears as if it were formed of several layers, rough and irregular internally, smooth and polished externally. The same thing happens, when any injection is pushed with such force into an artery, as to rupture the internal and muscular coats at some point of their circumference. Nicholls performed this experiment sever-

ral times before the Royal Society. (*Philos. Trans. an. 1728.*) As soon as the internal coat is ruptured, the muscular one also gives way; but, the external cellular sheath, being of an interlaced texture, and the thin laminae, of which it is composed, being not simply applied to one another, but, reciprocally intermixed, is capable of supporting great distention, by yielding gradually to the impulse of the blood, without being torn, or ruptured.

This celebrated professor is of opinion, that the same phenomena may be observed, when the internal coat of the aorta becomes so diseased, as to be ruptured by the repeated jets of blood from the heart. In this circumstance, the blood, impelled by the heart, begins immediately to ooze through the connexions of the fibres of the muscular coat, and gradually to be effused into the interstices of the cellular covering, forming, for a certain extent, a kind of *ecchymosis*, or *extravasation of blood*, slightly elevated upon the artery. Afterwards, the points of contact, between the edges of the fibres of the muscular coat being insensibly separated, the arterial blood, penetrating between them, fills and elevates, in a remarkable manner, the cellular covering of the artery, and raises it after the manner of an incipient tumour. Thus the fibres and layers of the muscular coat, being wasted, or lacerated, or simply separated from each other, the arterial blood is carried with great force, and in greater quantity, than before, into the cellular sheath of the artery, which it forces more outwards; and, finally, the divisions, between the interstices of the cellular coat being ruptured, converts it into a sac, which is filled with polypous concretions, and fluid blood, and at last forms, strictly speaking, the aneurismal sac. The internal texture, although apparently composed of membranes placed one over the other, is, in fact, very different from that of the proper coats of the artery, notwithstanding the injured vessel and aneurismal sac are both covered externally, in the thorax and abdomen, with a smooth membrane.

Scarpa has examined a considerable number of aneurisms, of the arch, and of the thoracic, and abdominal trunk, of the aorta, without finding a single one, in which the rupture of the proper coats of the artery was not evident, and in which, consequently, the sac was produced by a substance completely different from the internal and muscular coats.

The aneurismal sac never comprehends the whole circumference of the vessel. At the place where the tumour joins the side of the tube, the aneurismal sac pre-

sents a kind of constriction, beyond which it becomes more or less expanded. This would never happen, or rather the contrary circumstance would occur, if the sac were formed by an equable distention of the tube and proper coats of the affected artery. In incipient aneurisms, at least, the greatest size of the tumour would then be in the artery itself, or root of the swelling, while its fundus would be the least. But, whether aneurisms be recent and small, or of long standing and large, the passage from the artery is always narrow, and the fundus of the swelling greater in proportion to its distance from the vessel. The sac is always covered by the same soft dilatible cellular substance, which united the artery in a sound state to the circumjacent parts. Such cellular substance, in aneurisms of the thoracic aorta, is covered by the pleura, and, in those of the abdominal aorta, by the peritoneum, which membranes include the sac and ruptured artery, presenting outwardly a continued smooth surface, just as if the artery itself were dilated. But, if the aorta be opened lengthwise on the side opposite the constriction, or neck of the tumour, the place of the ulceration, or rupture, of the proper coats of the artery, immediately appears within the vessel, on the side opposite to that of the incision. The edge of the fissure, which has taken place, is sometimes fringed, often callous, and hard, and through it it was, that the blood formed itself a passage into the cellular sheath, which is converted into the aneurismal sac. If, as sometimes happens, in the arch of the aorta near the heart, the artery, before being ruptured, has been somewhat dilated, it seems, at first, as if there were two aneurisms; but, the constriction, which the sac next to the artery, presents externally, points out exactly the limits, beyond which the internal and muscular coats of the aorta had not been able to resist the distention, and where of course they have been ruptured. The partition, which may always be seen dividing the tube of the artery from the aneurismal sac, and which is lacerated in its middle, consists of nothing else than the remains of the internal and muscular coats of the ruptured artery.

By carefully dissecting the proper coats of the ruptured aorta in this situation, and comparing them with the cellular substance forming the sac, the truth of the preceding statement may be indisputably demonstrated.

When an incision is made lengthwise in the side of the vessel opposite the rupture, its proper coats are found either perfectly sound, or a little weakened and

studded with earthy points, but, still capable of being separated into distinct layers. On the contrary, in the opposite side of the aorta, where the rupture is, the proper coats are unusually thin, and are only separable from each other with difficulty, or even not at all; they are frequently brittle, like an egg-shell, and are disorganised and torn at the place where they form the partition between the ruptured artery and the mouth of the aneurismal sac. Continuing to separate these coats, from within outwards, we arrive at the cellular sheath surrounding the aorta. This sheath being much thickened in large aneurisms, and very adherent to the subjacent muscular coat of the artery at the place of the constriction of the sac, is very apt to be mistaken for a dilated portion of the vessel itself. But, even in such cases, we may at last separate it, without laceration, from the tube of the artery, above and below the injury, and, successively, from the muscular coat, as far as the neck of the aneurism. Then it is clear, the muscular coat does not pass beyond the partition, separating the cavity of the artery from that of the aneurismal sac, over which it is not prolonged, but terminates at the edge of the rupture like a fringe, or in obtuse points. Errors are rendered more apt to occur, in consequence of the aorta and sac being both covered by the pleura, or peritoneum.

The portion of the aorta, within the pericardium, being only covered by a thin reflected layer of this membrane, such layer may also be lacerated, when the proper coats give way, and blood be effused into the cavity of the pericardium. Examples of this kind are related by Walter, Morgagni, &c. and Scarpa himself. In the latter instance, on making an incision into the concave part of the aorta, opposite the tumour which had formed under the layer of the pericardium, which had also burst by a small aperture, its internal coat, corresponding to the base of the swelling, was quite rough, interspersed with yellow hard spots, and actually ulcerated for the space of an inch in circumference. The preparation is preserved in the museum at Pavia.

But all other parts of the aorta having, between them and the pleura and peritoneum, a cellular sheath of a stronger and more yielding nature, which allows itself to be distended into a sac, and being strengthened internally, by polypous layers, and, externally, by the pleura or peritoneum, oppose for a long while the fatal effusion of blood.

Scarpa believes, that what he calls the slow, morbid, steatomatous, fungous,

squamous, degeneration of the internal coat of the artery is more frequently the cause of its bursting, than violent exertions of the whole body, blows, or an increased impulse of the heart. This kind of diseased change is very common in the curvature, and thoracic and abdominal trunks, of the aorta. In the incipient state of such disease, the internal coat of the artery loses, for a certain space, its beautiful smoothness, and becomes irregular and wrinkled. It afterwards appears interspersed with yellow spots, which are converted into grains, or earthy scales, or into steatomatous, and cheese-like concretions, which render the internal coat of the artery brittle and so slightly united to the adjoining muscular coat, that, upon being merely scratched with the knife, or point of the nail, pieces are readily detached from it, and, on being cut, it gives a crackling sound, similar to the breaking of an egg-shell. This ossification cannot be said to be proper to old age, since it is sometimes met with in subjects not much advanced in life. The whole of the side of the artery, in that part which is occupied by the morbid affection, is, for the most part hard and rigid, sometimes soft and fungous, and, in most cases, the canal of the artery is preternaturally constricted. In the highest degree of this morbid disorganization, true ulcerations are found on the inside of the artery, with hard and fringed edges, fissures, and lacerations of the internal and fibrous coats of the artery.

Whenever an aneurismal sac of an immoderate size beats violently, and, for a long while against a bone, as the sternum, ribs, clavicle, and vertebrae, the bones are in the end invariably corroded, so that the aneurismal sac elevates the integuments of the thorax, or back, and pulsates immediately under the skin. Scarpa, with the best modern writers, attributes the effect to absorption, in consequence of the pressure.

Having presented the reader with an abridged account of the most important remarks, made by Scarpa, in support of the doctrine he defends, we now annex his conclusions. 1. That this disease is invariably formed by the rupture of the proper coats of the artery. 2. That the aneurismal sac, is never formed by a dilatation of the proper coats of the artery, but, undoubtedly, by the cellular sheath, which the artery receives in common with the parts contiguous to it; over which cellular sheath the pleura is placed in the thorax, and the peritoneum in the abdomen. 3. That if the aorta, immediately above the heart, appears sometimes increased beyond its natural diameter, this

is not common to all the rest of the artery, and when the aorta, in the vicinity of the heart, yields to a dilatation greater than natural, this dilatation does not constitute, properly speaking, the essence of the aneurism. 4. That there are none of those marks regarded by medical men as characteristic of aneurism from *dilatation*, which may not be met with in aneurism from *rupture*, including even the circumscribed figure of the tumour. 5. That the distinction of aneurism into *true* and *spurious*, adopted in the schools, is only the production of a false theory; since observation shews, that there is only one form of this disease, or that caused by a rupture of the proper coats of the artery, and an effusion of arterial blood into the cellular sheath, which surrounds the ruptured artery. (See *Treatise on Aneurism*, by A. Scarpa, translated by J. H. Wishart. Edinb. 1808.)

Even the believers in the doctrine of dilatation, will, I think, now agree with Sabatier, that, in what they call true aneurisms, the internal coats of the artery, that is to say, the cuticular and muscular coats, are mostly ruptured, while that which is called cellular, or elastic, is dilated, so as to form the pouch, in which the blood is contained. This, he says, is particularly apt to be the case, when these swellings are the consequence of some exertion or violent shock. The generality of modern surgical authors, by whom the true aneurism, attended with a real dilatation of all the coats of the artery, is implicitly believed, universally admit, that, when such a tumour has acquired a large size, the inner coats of the vessel, which are imagined to be dilated, may give way and be ruptured. The blood, forcibly impelled into the vessel, or tumour, is described as producing a laceration of the resisting coats, becoming effused within the cellular coat, which is very elastic, occasioning a separation of this tunic from the others, and collecting within it in a more or less considerable quantity. "I have found this proved," says Sabatier, "in nearly all the aneurisms which I have seen dissected, as well as in those, which I have examined myself, but, particularly in a subject, whose carotids I was about to inject. In endeavouring to expose these vessels, I found a large quantity of blood extravasated in the adjoining cellular substance. As they appeared to me to be larger than ordinary, my curiosity was excited, and I traced them to the aorta, which was extremely dilated, as was likewise the pericardium. The deep livid colour of this latter membrane shewed, that there was an accumulation

of blood in its cavity. In fact, a large quantity was found there, and the portion of the aorta, included within this membrane, was much enlarged. I soon perceived a considerable rent, which led into the cavity of the vessel, and, on this opening being made larger, I found, that the aorta began to be dilated at its origin from the heart, and that the increased size, which it had acquired, extended to the curvature, and the vessels arising there; that these arteries were contained in a kind of continuous sac, which had borrowed their form, though its width was greater; that they appeared to be stripped of their cellular covering, just as if they had been dissected for anatomical purposes; and, lastly, that it was the aorta itself, which was rent, a little way from the opening, that had taken place in its membranous covering within the pericardium. Similar cases are recorded by Morgagni, and others." (*Sabatier, op. cit. p. 165, 166.*)

Richerand does not altogether reject the doctrine of a dilatation of all the arterial coats; but, he asserts that this is only the case when the tumour is small and incipient, while, in aneurisms of a certain size and standing, two out of the three coats, which compose the parietes of the artery, namely, the internal and middle tunics, are constantly lacerated. (*Nosographie Chirurgicale, Tom. 4, p. 81. Edit. 2.*)

According to Sabatier, true aneurisms most frequently occur in the abdomen and thorax. Here, there are no pathognomonic signs, by which the existence of such swellings can be known with certainty, before the disease is sufficiently large to be felt externally; for, the symptoms produced differ according to the situation of the tumour, and are very like those of numerous other diseases, so that it is impossible to ascribe the complaints to this or that particular affection. Sometimes, the train or circumstances, which accompany aneurisms, joined with the patient's complaining of a strong throbbing in the situation of the disease, may lead to a suspicion of the nature of the case, even before the tumour can either be felt, or seen. When, however, true aneurisms are situated in the neck, or the extremities, they may easily be known by the ease, with which they yield to pressure, and by their pulsations; but the last symptoms may disappear, when the tumour has become exceedingly large.

The greater number of aneurisms increase gradually, and sooner or later incline to the side, on which the least resistance is experienced. De Haen mentions an aneurism, of the aorta, which

first made its appearance between the second and third ribs of the left side, and, which instead of growing larger, as is usual, subsided, and could neither be seen, nor felt, for more than a month before the patient's decease, although, on opening the body, a tumour of the arch of the aorta was found, three times as large as the first. De Haen imputes the sudden disappearance of the swelling to its weight, the yielding of the parts with which it was connected, and to its gravitating into the chest, when the patient lay on his right side; for, the difficulty of breathing, and other complaints, produced by the pressure on the lungs, underwent a material increase, as soon as the tumour ceased to protrude.

The pulsations, which accompany true aneurisms, continue to be strong, until the inner coats of the vessel give way, or the layers of coagulated blood, lodged in the sac, are numerous. Hence, when soft swellings, situated near any large arteries, lose their pulsatory motion, their course, precise situation, and other circumstances, ought to be most carefully investigated, before the surgeon ventures to make an opening. In many instances, the most fatal accidents have happened, in consequence of incisions having been made into aneurisms, which were mistaken for abscesses, because there was no pulsation. Vesalius was consulted about a tumour of the back, which he pronounced to be an aneurism. Soon afterwards, an imprudent practitioner made an opening in the swelling, and the patient bled to death in a very short time. Ruysch relates, that a friend of his, having opened a tumour near the heel, which was not supposed to be an aneurism, the greatest difficulty was experienced in suppressing the hemorrhage. De Haen speaks of a patient, who died in consequence of an opening, which was made into a similar swelling at the knee, although Boerhaave had given his advice against the performance of such an operation. Palfin, Schlitting, Warner, and others, have recorded mistakes of the same kind. (*Sabatier, Tom. 3, p. 167.*) Richerand informs us, that Ferrand, head surgeon of the Hôtel-Dieu, mistook an axillary aneurism for an abscess, plunged his bistoury into the swelling, and killed the patient. "*J'ai été témoin d'erreurs semblables, commises par des praticiens non moins fameux; et si des anéurismes externes on passe à ceux des artères placées à l'intérieur, les erreurs ne sont ni moins ordinaires ni de moindre conséquence.*" (*Nosographie Chirurgicale, Tom. 4, p. 75. Edit. 2.*)

Notwithstanding a pulsation is one of the most prominent symptoms of an aneu-

rism, it is not to be inferred, that every swelling which pulsates is unquestionably of this description; for, as Mr. Warner has explained, "it does happen, that mere imposthumations, or collections of matter, arising from external as well as internal causes, are sometimes so immediately situated upon the heart itself, and, at other times, upon some of its principal arteries, as to partake, in the most regular manner, of their contraction and dilatation.

"A few years ago," says he, "I saw an instance of a boy, about thirteen years of age, who had his breast-bone much fractured by a fall; on this account, he was admitted into Guy's Hospital; but, not till a fortnight after the accident had happened.

"Upon examination, there was an evident separation of the broken parts of the bone, which were removed some distance from each other. The intermediate space was occupied by a tumour of a considerable size; the integuments were of their natural complexion. The swelling had as regular a contraction and dilatation as the heart itself, or the aorta could be supposed to have. Upon pressure, the tumour receded; upon a removal of the pressure, the tumour immediately resumed its former size; all these are allowed to be distinguishing signs of a recent true aneurism. The situation and symptoms of this swelling were judged sufficient reasons for considering the nature of the disease as uncertain: on which account it was left to take its own course.

"The event was, the tumour burst in about three weeks after his admission; discharged a considerable quantity of matter; and the patient did well by very superficial applications." (*Cases in Surgery, by Joseph Warner, F.R.S. Edit. 4, p. 155.*)

A few years ago, I saw a large abscess in the situation of the quadratus lumborum muscle, which pulsated so strongly, that the case was supposed by several experienced men to be an aneurism of the abdominal aorta. The patient was a boy, belonging to Christ's Hospital, and under the care of Mr. Ramsden, surgeon to that establishment, by whose discernment the real nature of the case was detected. It is curious, that, in this instance, the pulsations of the swelling suddenly ceased, after having continued in a very strong and manifest way, and without interruption, for several weeks, during which it was under the observation of the above eminent practitioner.

The following case, recorded by Pelletan, shews, that an artery running more

superficially, than natural, may, under particular circumstances, give rise to the suspicion of an aneurism. A strong robust man, about forty years of age, was in the habit of going on foot to dine three leagues from Paris, every day, on the completion of his business. One day, having been this distance, and returned, he felt an acute pain along the leg, and in the right ankle. The pain did not subside, and a tumour appeared at the lower third of the leg, opposite the space between the two bones. The skin was of a yellowish colour from effused blood, and a pulsation existed, by which the hand of an examiner was lifted up. There seemed every reason for concluding that the case was an aneurismal swelling. In comparing the affected limb with the sound one, however, Pelletan perceived in the latter a similar kind of throbbing. In short, in both legs, the pulsation of an arterial tube could be felt for three inches, and, Pelletan distinctly ascertained, that, in the diseased member, the throbbing did not extend to the whole of the tumour, but only lengthwise. By a particular disposition in this individual, the anterior tibial artery, which usually runs along the interosseous ligament, covered by the tibialis anticus, and extensor communis digitorum pedis, came out from between these muscles, at the middle of the leg, and lay immediately under the skin and the fascia. The patient, curious about the circumstance, which had been mentioned to him, examined the legs of the whole of his family; and it appeared, that his daughter was the only one, in which the anterior tibial artery ran directly under the skin, in the same way, as it did in himself.

By confining the patient to his bed, says Pelletan, we were soon convinced, that the disease was not an aneurism; for the swelling and ecchymosis were gradually dispersed, and, it is more than probable, that the symptoms originated from the rupture of some muscular fibres, in the exertion of walking so great a distance. (*See Pelletan's Clinique Chirurgicale, Tom. 1, p. 101, 102.*)

According to Richerand, when an aneurism is recent and of small size, the dissection of the tumour exhibits a simple dilatation of the arterial coats; while, in other cases, where the aneurism is large, and has existed a considerable time, the internal and middle coats of the vessels, are invariably lacerated. In the early stage of the disease, the blood, which fills the aneurismal sac, is fluid, and, on the contrary, in cases, where the internal tunics of the artery are ruptured, the sac contains more or less coagulated

lymph. The external, or cellular coat composes the greater part of the cyst; and the coagulating lymph, with which it is filled, is arranged in layers, the density of which is described as being greater, in proportion to the length of time, which they have been deposited. Such as are nearest the sac are, therefore, represented as being most compact, and containing the smallest quantity of the colouring matter of the blood; more deeply the concretions of lymph resemble simple coagula; and, lastly, the blood, which is still nearer the arterial tube, retains its fluidity.

After the aneurismal sac has been cleansed from the lymph and coagulated blood, which it contains, its parietes will appear to be almost entirely formed of the cellular coat of the artery. Towards the bottom may be observed the aperture, arising from the laceration of the internal and middle coats, which, being much less elastic than the external, are ruptured in an early stage of the disease. It is when these two tunics give way, that the aneurismal tumour undergoes a sudden and considerable increase in its size; for, then, the cellular coat alone has to sustain all the pressure of the blood, which, now becoming effused into a more ample cyst, loses a great deal of its impetus, coagulates, and forms fibrous masses; circumstances to which may be ascribed the hardness of the swelling, the weakness of its pulsation, &c.

The aneurisms, which get well spontaneously, are so few, that this disease, when left to itself, may be regarded as generally fatal. But, nothing is subject to more variety, than its duration in different cases, the tumour bursting sooner or later, according as the patient happens to lead a life of labour, or ease, of intemperance, or moderation. Even the bursting of an internal aneurism may not immediately kill the patient, as the following uncommon instance proves: a stone-cutter died in the hospital Saint Louis, with an enormous aneurism, situated on the left side of the lumbar vertebræ. The body was opened by Richerand, who found, that the external tumour consisted of blood, which had been effused into a cyst, that was formed in the midst of the cellular substance of the loins. This fluid had passed into the situation specified, by making its way through the museles. The track, through which it came, led into another aneurismal sac, contained in the abdomen, and situated behind the peritoneum, on the left side of the lumbar vertebræ. In endeavouring to discover, whence the extravasated blood proceeded, Richerand found, that the abdominal aorta was entire, though

in contact with the swelling. The original affection consisted of an aneurismal dilatation of the inferior portion of the thoracic aorta, which had burst at the point, where it lies betwixt the crura of the diaphragm. The blood had probably escaped very slowly, and it had accumulated in the cellular substance, which surrounds the kidney, so that three cysts burst successively, before the patient died. (See *Richerand's Nosographie Chirurgicale*, Tom. 4, p. 82, Edit. 2.)

Aneurisms frequently destroy the bones with which they come into contact. There is perhaps hardly any surgeon who has not had many opportunities of seeing aneurismal swellings in the chest, forming an external protrusion, in consequence of the absorption of the ribs and sternum, or projecting backward against the spine, so as to occasion the destruction of the substance of the vertebræ, to a greater or lesser degree. There are few practitioners, who have not seen the lower part of the os femoris rendered carious by the pressure of large popliteal aneurisms.

The following case, related by Pelletan, is highly interesting, not only in exemplifying the degree, in which aneurismal swellings may injure the vertebræ; but also in shewing the liability of such tumours to be mistaken, for other diseases, and the enormous size, which they sometimes attain.

Francis Gensy was a robust healthy man, until the year 1803, when he met with a fall from his horse. From this period, he lost his usual gaiety and vivacity. Some time afterwards, he contracted the venereal disease, and put himself under the care of a quack. In 1805, supposing himself cured, he married. He had now become more dull, sorrowful, and pensive, than ever, and complained of pain about the kidneys, which he imputed to rheumatism. Last August, he was attacked with an intermittent fever, which readily yielded to suitable remedies. The following November, his horse fell down with him, and he communicated the accident to nobody; but, the pain about his kidneys became much more severe. It was not till the fourth of last March, that he consulted M. De-guise, a distinguished surgeon, belonging to the hospital at Charenton. Gensy complained of an acute pain in the left hip, which he described as shooting across the pelvis. As this circumstance caused rheumatism to be suspected, a blister was applied, which produced temporary relief, but was afterwards followed by convulsions of the whole body. Antispasmodics were prescribed with some

success; yet, the tongue became dry, the belly tender, the pulse quick and small, the sleep uneasy, and the loins more painful than ever. Attempts were made to procure the patient relief by putting him repeatedly in the warm bath; but, this plan being annoying to him, it was relinquished. He suffered acute pain in the abdomen, and his nights were very bad. At length, on the 15th of the following April, an oval tumour, that was imperfectly circumscribed, made its appearance in the right iliac region, in the track of the psoas muscle. It presented a distinct fluctuation, and it might easily have been mistaken for a collection of matter depending, says Pelletan, on a caries of the vertebræ, the cause of which could have been referred to the venereal disease, of which mention has been made. But on an attentive examination, pulsations were felt, which, as they increased from day to day, left no further doubt, concerning the nature of the swelling. It was at this period, that Pelletan was called into consultation with M. De-guise. The patient was now much emaciated; his pulse was scarcely perceptible; and his debility was extreme. Pelletan saw, that the disease was an aneurism, and could not but forebode the death of the patient. The deformity of the lowest dorsal vertebræ, where the centre of the pain lay, might have contributed to the idea of the case being a lumbar abscess with caries, had it not been known, that the enlargement of aneurisms may destroy the bodies of the vertebræ, as well as any other bone, which happens to be in the vicinity of the disease. The patient lived only ten days after Pelletan's visit.

On opening the body, an aneurismal tumour of prodigious size was discovered. It filled the cavity of the abdomen, from the lumbar and iliac regions of the right side, to the lumbar region of the left side, and it extended from the trunk of the celiac artery down to the bifurcation of the aorta, into the two iliac arteries. The trunk of the aorta divided the tumour into two pouches, of which the right was far the largest, occupying the iliac and lumbar regions. The swelling enveloped the right kidney, and was externally covered with the peritoneum, which membrane was pushed to some distance from the bowels. The quantity of blood, which the aneurism contained, was about five pints; three of which were in its right cavity, and two in its left. This fluid was nearly all in a coagulated state, the coagula being arranged in concentric layers, as is usual in such cases. The centre of the disease present-

ed an oval opening, about three inches long, and one broad, formed in the posterior part of the aorta, between the celiac and superior mesenteric arteries. Opposite to this aperture, the bodies of the two last dorsal, and of the two first lumbar vertebræ, were destroyed; an ordinary effect of aneurisms on such bones as happen to be near them, but, which effect Pelletan had never previously seen take place in so considerable a degree. The two cavities of the chest contained a large quantity of bloody serum, which had no connexion with the aneurism, and the lungs were sound.

Pelletan says, he never met with so large an aneurism; he thinks it probable, that it was brought on by the fall, which the patient met with in 1803, and that it had been increasing for six years. He states, that the man died from nearly the whole mass of the blood having passed into the aneurismal sac, most of the vessels, and the heart itself, being in fact quite empty.

However, the most interesting circumstance in this case, with regard to practice, was the resemblance, which the apparent symptoms of this aneurism bore to those of a lumbar abscess, with, or, without a caries of the vertebræ. (See *Pelletan's Clinique Chirurgicale*, Tom. 1, p. 97—100.)

Aneurisms often seem to originate spontaneously, it being in many instances exceedingly difficult to assign any cause for the commencement of the disease. Among the circumstances, which predispose to aneurisms, however, the large size of the vessels may undoubtedly be reckoned. Those trunks, which are near the heart, are said to have much thinner parietes, in relation to the magnitude of the column of blood, with which they are filled, than the arteries of smaller diameter; and since the lateral pressure of this fluid against the sides of the arteries, is in a ratio to the magnitude of these vessels, it follows, that aneurisms must be much more frequent in the trunks near the heart, than in such as are remote from the source of the circulation. (*Richerand, Nosographie Chirurgicale*, Tom. 4, p. 72, Edit. 2.) The whole arterial system is liable to aneurisms; but, says Pelletan, experience proves, that the internal arteries are much more frequently affected, than those which are external. (*Clinique Chirurgicale*, Tom. 1, p. 54.)

The curvatures of the arteries are another predisposing cause of the disease, and, according to Richerand, such cause has manifest effect in determining the formation of the great sinus of the aorta, the dilatation, which exists between the

CROSS and the origin of this large artery, and is the more considerable, the older the person is. Monro rightly observes on this subject, that one half of old persons have an aneurism at the beginning of the aorta.

There is one artery of moderate size, without any curvature, which is nevertheless more subject to aneurism, than other vessels of much larger diameter: the popliteal artery is that, which is here alluded to. The crural, of which this last is only the continuation, is much less commonly affected. This frequency of aneurisms of the popliteal artery does not depend upon the vessel being situated in the middle of a very extensible cellular substance; for, the crural, at its upper third, is not better supported by the surrounding parts. The cause is imputed by Richerand to the situation of the artery in the ham, at the back of the knee joint, an articulation, of which the extension is only limited by the resistance of such tendons, ligaments, and soft parts, as are placed behind it. In the stretching, to which all the parts behind the joint are subjected, when the leg is forcibly extended on the thigh, the artery, whose texture is the slightest, is particularly apt to be lacerated. Richerand affirms, that, out of twelve popliteal aneurisms, which he has seen, either in hospital, or private practice, ten have been caused by a violent extension of the leg. This statement, he says, will derive confirmation from the following experiments:

Place the knee of a dead subject on the edge of a firm table, and press on the heel, so as forcibly to extend the leg far enough to make the ligaments of the ham snap. Now dissect the part, cut out the artery, and examine its parietes in a good light, when the lacerations of the middle coat will be observable, and rendered manifest by the circumstance of those places appearing semitransparent, where the fibres are separated, the parietes at such points merely consisting of the internal and external tunics. (*Nosographie Chir. Tom. 4, p. 73, 74, Edit. 2.*)

The implicit belief, however, which Richerand seems to place in the idea, that the laceration of the middle coat of an artery will bring on an aneurism, while the inner coat is perfect, will appear to be unfounded, when it is remembered, that Hunter and Home even dissected off the external and middle coats of arteries, without being able in this manner to cause an aneurism.

Pelletan accounts for the frequency of popliteal aneurisms somewhat differently from Richerand: speaking of the two

principal motions of the knee, viz. extension and flexion, he remarks, that the first of these is so limited, that it is actually an incipient flexion, necessarily produced by the curvature backward both of the condyles of the femur, and those of the tibia. This curvature, which would seem to protect the popliteal artery against any dangerous elongation, that might otherwise be caused by a forcible extension of the joint, becomes the very source of such an elongation in persons, who are accustomed to keep their limbs bent, or, who, from this state, proceed hastily and violently to extend the leg. The arterial tubes are really shortened, when the limbs are in the state of flexion, and lengthened, when the extension of the members renders it necessary. Hence, says Pelletan, it is manifest, that an habitual shortened state of these vessels, and their sudden elongation, must be attended with hazard of rupturing their parietes. (*Clinique Chirurgicale, Tom. I. p. 112.*)

Aneurisms are exceedingly common in the aorta, and they are particularly often met with in the popliteal artery. The vessels, which are next to these the most usually affected, are the crural, common carotid, subclavian, and brachial arteries. The temporal and occipital arteries, and those of the leg, foot, forearm, and hand, are far less frequently the situations of the present disease. But, although it is true, that the larger arteries are the most subject to the ordinary species of aneurisms, the smaller arteries seem to be more immediately concerned in the formation of one peculiar aneurismal disease, now well known by the name of the *aneurism by anastomosis*, of which I shall hereafter speak.

According to surgical writers, the causes of aneurisms operate either by weakening the arterial parietes, or by increasing the lateral impulse of the blood against the sides of these vessels. It is said to be in both these ways, that the disease is occasioned by violent contusions of the arteries, the abuse of spirituous drinks, mercurial courses too often repeated, fits of anger, rough exercises, exertions in lifting heavy burdens, &c. In certain persons, aneurisms appear to depend upon a particular organic disposition. Of this description was the subject, whose arteries, on examination after death, were found by Lancisi affected with several aneurisms of various sizes. I have known a person, who had an aneurism of one axillary artery, which disease got spontaneously well, but, was soon afterwards followed by a similar swelling of the opposite axillary artery, which last affliction proved fatal. I have

seen another instance, in which an aneurism of the popliteal artery was accompanied with one of the femoral in the other limb. The most remarkable case, however, proving the existence of a disposition to aneurisms in the whole arterial system, is mentioned by Pelletan. "J'ai pourtant vu plusieurs fois ces nombreux aneurismes occupant indistinctement les grosses ou les petites artères, mais sur-tout celles des capacités; j'en ai compté soixante trois sur un seul homme, depuis le volume d'une aveline jusqu'à celui de la moitié d'un œuf de poule. (*Clinique Chirurgicale*, Tom. 2, p. 1.)

In this country it has been noticed, that popliteal aneurisms occur with particular frequency in postilions and coachmen, whose employments oblige them to sit a good deal with the knees bent. It has been observed in France, by Richerand, that the men, who clean out the dissecting rooms, and procure dead bodies for anatomists, almost all die of aneurismal diseases. This author remarks, that he never knew any of these persons, who were not addicted to drinking, and he comments on the debility, which their intemperance and disgusting business together must tend to produce. (*Nosographie Chirurgicale*, Tom. 4, p. 74, Edit. 2.)

Aneurisms of the axillary artery appear, in some instances, to have arisen from violent extension of the limb. (See the cases recorded by Pelletan in *Clinique Chirurgicale*, Tom. 2, p. 49, and 83.) In other examples, related by the same interesting practical writer, aneurisms arose from reiterated contusions and rough pressure on parts. (*Op. cit.* p. 10, p. 14.)

The extremity of a fractured bone may injure an artery, and give rise to an aneurism, an instance of which is recorded by Pelletan. (*Op. cit.* Tom. 1. p. 178.) The disease followed a fracture of the lower third of the leg. An aneurism of the anterior tibial artery, from such a cause, is also described in *Mr. Charles White's Cases in Surgery*, p. 141.

The following case of an aneurism of the humeral artery, after amputation, is recorded by Warner: C. D. was afflicted with a caries of the joint of the elbow, which was attended with such circumstances, as rendered the amputation of the limb necessary. The operation was performed at a proper distance above the diseased part, and the vessels were taken up by the needle and ligatures.

In a few days, after the operation, the humeral artery became so dilated above the ligature as to endanger its bursting. Upon this account, it was judged necessary to perform the operation for the

aneurism, which was done, and the vessel was secured by ligature, above the upper extremity of its distended coats. After this operation, every thing went on, for some time, exceedingly well, when suddenly the artery appeared again dilated, and was in danger of bursting above the second ligature. These circumstances made it necessary to repeat the operation for the aneurism. From this time, every thing went on successfully, till the stump was at the point of being healed; when, quite unexpectedly, the artery appeared a third time diseased in the same manner as before; for which reason, a third operation for aneurism was determined on, and performed.

The last operation was near the axilla. The patient continued well, from this time, without any relapse.

Query. Could the several aneurisms of the humeral artery, (says Mr. Warner) be attributed to the sudden check alone, which the blood met with from the extremity of the vessel being secured by ligature; or is it not more reasonable to suppose, that the coats of the artery, nearly as high up as the axilla, were originally diseased and weakened? The latter, in the opinion of this judicious writer, seems the most probable way of accounting for the successive returns of the disease of the vessel: since it is found from experience, that such accidents have been very rarely known to occur after amputations, either of the arm, or thigh, where nearly the same resistance must be made to the circulation in every subject of an equal age and vigour, who has undergone the like operation.

If it should be supposed, that the several dilations of the coats of the vessels, continues Mr. Warner, arose merely from the check in the circulation, it will not be easy to account for the final success of this operation; and, especially, when we reflect, that the force of the blood is increased in proportion to its nearness to the heart. (See *Cases in Surgery*, by J. Warner, F. R. S. p. 139, 140, Edit. 4.)

Aneurisms sometimes follow the injury, which a large artery suffers in gunshot wounds. The passage of a bullet through the thigh, in one example, gave rise to a femoral aneurism. (See *the Parisian Surgical Journal*, Vol. 2, p. 109.)

TREATMENT OF ANEURISMS IN GENERAL.

A complete cure of an aneurism cannot be effected, in whatever part of the body the tumour is situated, unless the artery, from which the aneurism is derived, be, by nature or art, obliterated and converted into a perfectly solid, ligamentous sub-

stance, for a certain extent above and below the place of the ulceration, laceration, or wound. When aneurisms are cured by compression, the cure is never accomplished, as some have supposed, by the pressure strengthening and dilated proper coats of the artery, and restoring, especially to the muscular coat, the power of propelling the blood along the tube of the artery, as it did previously to its *supposed dilatation*. M. Petit and Foubert thought, that the natural curative process sometimes consisted in a species of clot, which closed the laceration, ulceration, or wound of the artery, and resisted the impulse of the blood, so as still to preserve the continuity of the coats of the artery, and the pervious state of the vessel. Haller imbibed a similar sentiment, from experiments made on frogs.

That a punctured artery may occasionally be healed in this manner, Scarpa proves by a case which he examined, in which an aneurism took place from the wound of a lancet in bleeding. In the article *Hemorrhage* we shall see, that Jones's experiments shew the same thing, and the particular circumstances in which it may happen. But, the occurrence is excessively rare, and can hardly be called a *radical cure*, as the cicatrix is always found in a state ready to burst and break, if the arm is, by any accident, violently stretched or struck, where the wound was situated.

Whenever the ulcerated, lacerated, or wounded artery, is accurately compressed against a hard body, like the bones, it ceases to pour blood into the surrounding cellular sheath, because its sides, being kept in firm contact, for a certain extent, above and below the breach of continuity, become united by the adhesive inflammation, and converted into a solid, ligamentous, cylinder. Molinelli, Guattani, and White, have given examples and plates, illustrative of this fact. When aneurisms get well spontaneously, the same fact is observed after death, as Valsalva, Ford, &c. have demonstrated. I have myself seen in St. Bartholomew's Hospital, an instance, in which a man had had a spontaneous cure of an aneurism in the left axilla, but afterwards died of hemorrhage from another one under the right clavicle; the artery on the left side was found completely impervious. My friend, Mr. Albert, had under his care, in the York Hospital, Chelsea, a dragoon, who recovered spontaneously of a very large aneurism of the external iliac artery: the tumour sloughed, discharged about two quarts of coagulated blood, and then granulated and healed up. Paoli relates a similar ter-

mination of a popliteal aneurism. Moinichen and Guattani, relate other examples. Hunter found the femoral artery quite impervious, and obliterated, at the place where a ligature had been applied fifteen months before. Boyer noticed the same fact in a subject, eight years after the operation. Petit relates a spontaneous cure of an aneurism at the bifurcation of the right carotid, and the subject having afterwards died of apoplexy, the vessel on dissection, was found closed up and obliterated from the bifurcation, as far as the right subclavian artery. Desault had an opportunity of opening a patient, in whom a spontaneous cure of a popliteal aneurism was just beginning; he found a very hard, bloody thrombus, which extended for three finger-breadths, within the tube of the artery, above the sac, and was so firm, as to resist injection, and make it pass into the collateral branches.

Both the spontaneous and surgical cures of aneurisms, have two stages; in the first, the entrance of the blood into the aneurismal sac is interrupted; in the second, the parietes of the artery approach each other, and, becoming agglutinated, the vessel is converted into a solid cylinder. This doctrine is corroborated by the tumour first losing its pulsation, and then gradually diminishing and disappearing. Dr. Thomson, as well as Scarpa, has long expressed his opinion, that the spontaneous radical cure of aneurisms, may sometimes arise from the pressure of the aneurismal sac on the trunk of the injured artery, just above the communication between the vessel and the cavity of the aneurism. Morand proved that a violent blow may lead to the obliteration of an artery, and Dr. Jones has demonstrated, that arteries always become impervious, after having a tight ligature put round them, even though such ligature be removed the moment after its application.

When an aneurism is affected deeply by gangrene, a dense, compact, bloody, coagulum is formed within the vessel, shutting up its canal, and interrupting completely the course of the blood. Hence the sphacelation which follows, and the bursting of the integuments, and of the aneurismal sac, are never accompanied by a fatal hemorrhage, and the patient is cured of the gangrene and the aneurism, if he has strength sufficient to resist the destructive action of the sphacelus on the constitution. When a patient dies of hemorrhage, after the mortification of an aneurism, it is because only a portion of the integuments and sac has sloughed, without the root of the aneu-

rism, and, especially, the arterial trunk, being in this way affected.

In order that compression may make the opposite side of an artery unite, and thus produce a radical cure of an aneurism, Scarpa says, the degree of pressure must be such as to place these opposite sides in firm and complete contact, and such as to excite the adhesive inflammation in the coats of the artery, which must also possess a state of vitality, presently to be noticed. The point of compression must also fall above the laceration, or wound of the artery; for, when it operates below, it hastens the enlargement of the tumour; and Scarpa adds, that, in practice, bandages, which are expulsive and compressive, are more useful for making pressure, than any tourniquets or instruments, many of which, are contrived to operate, without retarding the return of blood through the veins.

For pressure to succeed, the coats of the vessel must possess, at the place where it is made, such a degree of vitality, as to be capable of feeling the stimulus, and of inflaming. When the arterial coats, round the root of the aneurism, are diseased, as above described, they are insusceptible of the adhesive inflammation, although compressed together in the most scientific manner, and, even when tied with a ligature, which only acts by making circular pressure on the vessel.

Some advise trying compression in every case of aneurism, whether small, circumscribed, soft, flexible, indolent, or elevated, diffused, hard, and painful. In the latter case, however, compression is hurtful. Every bandage, which compresses the aneurism, and also constricts circularly the affected part, is always injurious. The bandage, likewise, which, compressing only the aneurism, directs the point of pressure below the rupture in the vessel; that which, on account of the great size, exquisite sensibility, depth of the root, of the aneurism, and fleshiness of the surrounding parts, cannot effectually compress the artery against the bones, so as to bring the opposite sides of the vessel into contact; and, lastly, the compression applied to a spontaneous aneurism, attended with a steatomatous, ulcerated, earthy, disease of the arterial coats; ought to be considered as an useless, or rather hurtful plan. In cases of a completely opposite description, bandages have produced, and may produce, radical cures of aneurism, and should not be entirely disused.

Guattani first employed compression systematically for the cure of aneurisms, and he has related many cases, in which

he succeeded. Freer details other ones; but, in general, pressure has hitherto been applied to the tumour itself, a method less likely to answer, than that of making pressure on a sound part of the artery. Mr. Freer recommends the employment of Sennio's instrument, or the following method: first place a bandage moderately tight, from one extremity of the limb to the other; then place a pad upon the artery, a few inches above the tumour; next, surrounding the limb with a tourniquet, let the screw be fixed upon the pad, having previously secured the whole limb from the action of the instrument, by a piece of board wider than the limb itself, by which means the artery only will be compressed, when the screw is tightened. The tourniquet should now be twisted till the pulsation in the tumour ceases. In a few hours the limb will become œdematous and swelled, when the tourniquet may be removed, and the pressure of a pad and roller will afterwards be enough. By experiments which this gentleman made on the radial arteries of horses, these vessels were found to become inflamed, and to be rendered impervious by such a process. (*Freer, p. 112.*)

Mr. A. Cooper mentions an excellent machine for compressing the femoral artery, in cases of popliteal aneurism. It was used by Sir W. Blizard.

"The points of support for this instrument were the outer part of the knee, and the great trochanter, a piece of steel passing from one to the other; and to the middle of this a semicircular piece of iron was fixed, which projected over the femoral artery, having a pad at its end, moved by a screw, by turning which, the artery was readily compressed, and the pulsation in the aneurism stopped, without any interruption to the circulation in the smaller vessels." But, although the patient on whom it was tried possessed unusual fortitude of mind, and indifference to pain, he was incapable of supporting the pressure of the instrument longer than nine hours. Indeed, the agony arising from long continued pressure is insupportable to almost all men. (*Med. and Phys. Journal, Vol. 8.*)

The grand means most to be depended upon, however, for curing aneurisms, is tying the artery above the tumour. This more certainly prevents the usual ingress of blood into the sac, and, what is more important, more certainly excites the adhesive inflammation, by dividing the internal coats of the vessel. The blood in the sac is afterwards gradually absorbed, and the tumour dwindles away in proportion. The natural course of the blood

being now permanently interrupted in the arterial trunk, it passes more copiously into the collateral branches, and these enlarging and anastomosing with others, which originate from the large arteries beyond the obstruction, the necessary circulation is carried on.

The ligature of the superficial femoral artery, may be performed with the same confidence of success, as the ligature of the brachial artery, that is, without any fear of destroying the circulation, or depriving the subjacent limb of its vitality. Indeed, the numerous and conspicuous anastomoses, which are met with all round the knee, correspond exactly with those which are observed round the elbow, and at the bend of the arm. This is not a peculiarity of the arteries of the extremities, but it is a general rule which nature has followed in the distribution of all the arteries, that the superior trunks communicate with the inferior, by means of the lateral vessels. After the principal trunk of an artery is tied, its lateral branches not only carry on the circulation in the parts below the ligature, but do so with greater quickness and activity than they did before, when the course of the blood was unimpeded through the principal trunk. This evidently arises from the increase of pressure which the blood, that takes the rout of the lateral vessels, receives, as well as from the enlargement in the diameter of these vessels. After the amputation of the thigh, while the blood flows in a full stream from the superficial femoral artery, very little or no blood is poured out of the lateral vessels; but as soon as that artery is tied, the blood issues with impetuosity from the small arteries which run along, within the vasti and cruraus muscles; and, on these smaller arteries being also tied, the blood immediately oozes out, from the minute arterial vessels of the muscles and cellular membrane. When the principal trunk of an artery is tied, its lateral branches gradually acquire a much larger diameter. After amputation of the thigh, on account of a popliteal aneurism, the size and situation of which could not fail materially to impede the course of the blood through the trunk of the femoral artery, it has been often remarked, that, although both the trunk and the greater and smaller branches, had been tied with the greatest accuracy, the patients have been in danger of losing their lives, on account of the repeated copious hemorrhages from the innumerable small lateral vessels, that had become unusually enlarged. In several cases, during the treatment, and especially after the radical cure of pop-

liteal aneurism, by tying the superficial femoral artery, in the upper third of the thigh, all the ramifications of the recurrent popliteal arteries have been felt beating strongly round the knee. Boyce found, in a man, who some years before had been operated on for a popliteal aneurism, but had afterwards died from a caries of the tibia, that the arterial branch, which runs through the substance of the sciatic nerve, was dilated so much, as to be equal in diameter to the radial artery. White, in dissecting the arm of a lady, who, fifteen years before had been operated on for an aneurism in the bend of the arm, found the brachial artery obliterated, and converted into a solid cylinder, for three inches below the place of the ligature, and as far as the division into the radial and ulna arteries; but, the recurrent radial and ulnar branches had become so much enlarged that, taken together, they exceeded the size of the brachial artery, above the situation of the ligature. In the dead body it is found, that an anatomical injection will pass more freely from one extremity to the other of an aneurismatic, than of a sound limb, and this, even when no vessels are visibly enlarged. Although it be self-evident, that the circulation through the collateral vessels ought to be much more easy and quick the lower down the ligature is applied to the principal trunk; yet, experience shews, that this difference is not to be estimated very high; for in cases of popliteal aneurism, *ceteris paribus*, the success is the same, whether the femoral artery be tied very low down, or very high up in the thigh. (*Scarpa*.)

This facility of the passage of the blood through the lateral vessels, is not the same in subjects of all ages; and, in the same subject; it is not the same in the inferior, as in the superior extremity. An age under forty-five, and the operation being done on the arm, which is nearer the source of the circulation, than the lower extremity, increases the chance of success.

The circumstances chiefly preventive of success, especially in the popliteal and femoral aneurisms, are the following: Rigidity, atony, or disorganization of the principal anastomoses, between the superior and inferior arteries of the ham and leg; sometimes depending on advanced age, or on it, together with the large size of the aneurism, which, by long continued pressure, has caused a great change in the neighbouring parts: or sometimes on steatomatous, ulcerated, earthy, cartilaginous, disorganization of the proper coats of the artery, not confined to the

seat of the rupture, but extending a great way above and below the aneurism, and also to the principal popliteal recurrent arteries, tibial arteries, and occasionally, to portions of the whole track of the superficial femoral artery. Sometimes, the pressure of large aneurisms, renders the thigh bone carious. In such circumstances the ligature is apt to fail in closing the trunk of the artery; and, if it should succeed, the state of the anastomosing vessels will not admit of a sufficient quantity of blood being conveyed into the lower part of the limb. Hence, when the patient is much advanced in life, languid and sickly, when the internal coat of the artery is rigid, and incapable of being united by a ligature; when the aneurism is of long standing, and considerable size, with caries of the os femoris, or tibia; when the leg is weak and cold, much swelled, heavy, and œdematous; Scarpa considers the operation contra-indicated. I must, however, declare in this place, that I have seen very large aneurisms, as well as aneurisms in persons of advanced age, cured by the Hunterian plan, in St. Bartholomew's Hospital.

It appears, then, that the obliteration of the artery, for a certain extent, above and below the place of rupture, forms the primary indication in the radical cure of aneurism, whether compression or the ligature, be employed. All other means are only auxiliary. Internal remedies may be useful in so far as they tend to moderate the determination of the blood towards the place, where the artery has been tied or compressed. Bleeding in young, very robust, plethoric patients, low diet, diluent drinks, gentle laxatives and glysters, mental and bodily rest, and cool air, have such effect. When there is weakness, not from age, but from pain, long want of rest, or loss of blood, tonics, cordials, and a moderate diet, may be given. Scarpa also advises the outward use of corroborants and stimulants; but, I think, few English surgeons will approve the practice.

Notwithstanding, however, aneurisms cannot in general be cured, as Scarpa has explained, unless the artery be rendered impervious for some extent above and below the tumour, I believe, we must make an exception to this observation, with respect to the few aneurisms of the aorta, (especially those of its arch,) which, according to the records of surgery, have been diminished and cured by Valsalva's treatment. In such examples, we are not to suppose, that the aorta becomes obliterated at its very beginning; but, that the diminution of the quantity of

circulating blood, the reduced impetus of this fluid, the lessened distention of the aneurismal sac, the general weakness induced in the constitution, and the increased activity of the lymphatic system, all necessary effects of Valsalva's method, have combined to bring about a partial subsidence of the tumour.

In internal aneurisms, and other cases, out of the reach of operative surgery, practitioners have usually been content with prescribing occasional bleedings, debilitating remedies, abstinence, a milk diet, and quietude, &c. As bleeding, however, cannot always be frequently repeated, instead of it, Scarpa says, the hands and feet may be immersed in tepid water, the limb rubbed, and water given internally, with a small quantity of Hoffmann's liquor anodynus mineralis. (*Spir. Ætheris. Comp.*) The great difficulty of breathing, adds the same writer, may receive a temporary relief, by applying sinapisms. All pressure on the tumour, when it protrudes externally, should be avoided, as it might increase the compression on the viscera, and would certainly accelerate the fatal bursting of the aneurism.

Digitalis has been given with advantage; but, occasional bleedings, and opium, have been found to produce most relief. In the latter stage, opium can alone be relied on. (*Freer.*)

It must be acknowledged, that practitioners have too commonly abandoned, such aneurisms as do not admit of an operation, as inevitably fatal, and, whatever measures have been taken, in cases, of this kind, have rather been pursued with a view of palliating the patient's sufferings, than with any hope of effecting a cure. Yet, we shall find, in the ensuing section of this article, that some exceedingly large aneurisms of the aorta itself, have been cured by copious and repeated, venesections, and the rigorous adoption of Valsalva's practice. Were the same treatment more generally followed, no doubt, internal aneurisms might seem much more curable than they have usually been regarded.

The celebrated Desault conceived, that, when an aneurism was so situated, that a ligature could not be applied to the artery leading to the swelling, a cure might possibly arise from tying the vessel, on that side of the tumour, which was most remote from the heart. Desault conjectured, that, by this means, the circulation through the sac would be stopped, the blood in it would coagulate, that the circulation would go on by the collateral arteries, and that the tumour would be finally absorbed. These spe-

sulations, however, were not found to answer in practice. Dechamps tied the femoral artery below an inguinal aneurism; but the progress of the disease, instead of being checked, seemed to be accelerated by this novel experiment. The operator was obliged, as a last resource to open the tumour, and try to take up the vessel. In this attempt, the patient lost a large quantity of blood, and died eight hours afterwards. (See *Œuvres Chir. de Desault par Bichat, Tom. 2, p. 568.*)

OF ANEURISMS OF THE AORTA, AND VALSALVA'S TREATMENT.

This afflicting and fatal disease is by no means unfrequent, and the arch of the aorta is the most common situation of the tumour. Dr. Hunter was of opinion, that the latter circumstance depended on the forcible manner, in which the blood, propelled from the left ventricle of the heart, must be driven against the angle of the curvature of the vessel. The same distinguished physician also thought, that the aneurismal sac was composed of the dilated coats of the artery, which parts nature thickened and studded with ossifications, after the origin of the disease, for the purpose of resisting its increase. The writings of Scarpa, however, make it appear highly probable, that, the generality of aneurisms of the aorta are the consequence of a rupture of the proper coats of this large vessel; and that the cellular sheath of the artery is what becomes distended into the thickened and ossified aneurismal sac. It seems also a fact, that, when the coats of the aorta give way in a certain situation (*viz.* within the pericardium) where they only receive a very slight external membranous covering, this last part is also apt to be ruptured at the same time, so as to bring on a copious effusion of blood in the chest, and sudden death.

If these things be true, (and, they appear to be confirmed by most careful and accurate dissections) the common distinction of aneurisms into *true* and *false*, or into aneurisms by *dilatation* and *rupture*, can no longer be regarded as accurate, as we have already explained. Therefore, the idea of Dr. Hunter, that aneurisms of the aorta were swellings of this vessel itself was a mere supposition, and the aneurismal sac, in these, as in all other cases, is composed of the sheath of cellular substance, which surrounds the artery.

We have stated, that Dr. Hunter considered the ossifications of the sac as consequences of the disease; but the celebrated Haller looked upon such scales of

bone in the aorta as the very cause of the affection, by rendering the artery inelastic, and incapable of yielding to each pulsation of the heart.

It is very certain, that aneurisms of the aorta are most commonly met with in persons, who are advanced in life, and, it is equally well known, that the aorta of every old subject, whether affected with aneurism, or not, is almost always marked in some place, or another, with ossifications, or, rather, with calcareous concretions. Such productions appear to occasion a decay, or absorption, of the muscular and inner coats of the vessel, so that, at length, the force of the blood makes the artery give way, and this fluid, collecting on the outside of the laceration, or rupture, gradually distends the external sheath of the artery into the aneurismal sac, which itself becomes at least of considerable thickness and studded with ossified specks.

"If any person, who is not prejudiced in favour of the common doctrine, with regard to the nature and proximate cause of this disease (says Scarpa), will examine, not hastily and superficially, but, with care and by dissection, the intimate structure and texture of the aneurism of the aorta, unfolding with particular attention the proper and common coats of this artery, and, in succession, those, which constitute the aneurismal sac, in order to ascertain distinctly the texture and limits of both, he will clearly see, that the aorta, properly speaking, contributes nothing to the formation of the aneurismal sac, and, that, consequently, the sac is merely the cellular membrane, which, in the sound state, covered the artery, or that soft cellular sheath, which the artery received in common with the neighbouring parts. This cellular substance, being raised and compressed by the blood, effused from the corroded or lacerated artery, assumes the form of a circumscribed tumour, covered externally, in common with the artery, by a smooth membrane, such as the pleura in the thorax, and the peritoneum in the abdomen.

"I do not pretend to deny, (continues this accurate anatomist,) that, sometimes, in consequence of congenital relaxation of the proper coats of the aorta, at its exit from the heart, a certain degree of yielding of these coats may contribute to the rupture of the aorta at this place, and, by that means, to the formation of an aneurism, which, in this case, is likewise conjoined with a certain degree of preternatural dilatation of the whole tube of the artery. I only deny, that dilatation of this artery precedes and accompanies every aneurism of the aorta, and am unwilling

to admit, that, in the formation of this formidable disease, the proper coats of the aorta ever yield so much to distention, as to form the aneurismal sac. With regard to this point, it is a fact worthy of the attention of medical men, and of all those, who wish to investigate this subject, that the root of an aneurism of the aorta, in whatever point of this artery it appears, never includes the whole circumference of the tube of the artery; but, that the root constantly occupies and involves only the one, or the other side of the artery, from which side, the aneurismal sac rises and enlarges, in the form of an appendix, or tuberosity, more or less large and extended, according to the circumstances of the place, or of the period of the disease; while, on the contrary, the dilatation of the artery occurs constantly in the whole circumference of the tube, and therefore differs essentially from aneurism." (*Scarpa on the Anatomy, Pathology, and Surgical Treatment of Aneurism, Transl. by Wishart, p. 55, 56.*)

In whatever manner aneurisms of the aorta are formed, there are no diseases, which are more justly dreaded, or which more completely fill the surgeon, as well as the patient, with despair. No affliction, indeed, can be more truly deplorable; for, the sufferings, which are occasioned, hardly ever admit even of palliation, and the instances of recovery are so very few, that no consolatory expectation can be indulged of avoiding the fatal end, to which the disease naturally brings the miserable sufferer.

The existence of aneurisms of the aorta, is scarcely ever known with certainty, before they have advanced so far, as to be attended with an external pulsation, and a tumor, that admits of being felt, or even seen. In very thin subjects, the throbbing of the abdominal aorta is sometimes unusually plain through the integuments and viscera, and this has occasionally given rise to the suspicion of an aneurism; a circumstance, which deserves to be remembered by every surgeon, desirous of not pronouncing a wrong opinion. While thoracic aneurisms of the aorta are accompanied with no degree of external swelling, the symptoms are all equivocal, and might depend on a disease of the heart, angina pectoris, and several other affections. Violent and irregular throbings frequently occur between the fourth and fifth true ribs of the left side; the same irregularity of the pulse prevails as often proceeds from organic affections of the heart; the respiration is exceedingly obstructed; the voice altered; and, in a more advanced period of the malady, the patient is at times almost suffocated. The

pressure of the internal swelling on the trachea, bronchia, and lungs is sufficient to account for this difficulty of breathing. In many instances, the irritation and compression, produced by the tumor, occasion an absorption of the greater part of the lungs, and abscesses and tubercles throughout the portion, which remains. Even the function of deglutition suffers interruption, in consequence of the pressure made on the œsophagus, which may even be in a state of ulceration. Thus, in an example recently published, we read, that "the cavity of the windpipe was nearly obliterated from the pressure of the aneurism; and the extremities of four of its cartilages lay in the œsophagus, having entered that canal, through an ulcer in its coats." (*Transactions of a Society for the Improvement of Med. and Surgical Knowledge, Vol. 3, p. 83.*) The way, in which aneurisms of the thoracic aorta prove fatal, is subject to considerable variety. These swellings do not always destroy the patient by hemorrhage; in numerous instances, the magnitude of the disease so impedes respiration, that death seems induced by suffocation, and not a drop of blood is found internally effused. Frequently, (to use the description of Mr. John Bell) before the awful and fatal hemorrhage has had time to occur, the patient perishes of sufferings too great for nature to bear. The aneurismal tumour so fills the chest, so oppresses the lungs, compresses the trachea, and curbs the course of the descending blood, that the system, with a poor circulation of ill-oxygenated blood, is quite exhausted. And, thus, though the patient is saved from the most terrible scene of all, he suffers great miseries; he experiences in his chest severe pains, which he compares with the stabbing of knives; terrible palpitations; an awful sense of sinking within him; a sound within his breast, as if of the rushing of waters; a continual sense of his condition; sudden startings during the night; fearful dreams and dangers of suffocation, until, with sleepless nights, miserable thoughts by day, and the gradual decline of an ill-supported system, he grows weak, dropsical, and expires. (See *Anatomy of the Human Body, by John Bell, Vol. 2, Edit. 3, p. 234, 235.*)

The situations, in which aneurisms of the curvature of the aorta burst, are different in different cases. Sometimes the swelling bursts into the cavity of the chest, or that of the pericardium, and the patient drops suddenly down. In other examples, the blood is effused into the trachea, or bronchia, and the patient, after violent coughings and ejections of blood from the mouth, expires. In cer-

tain cases, the swelling beats its way through the ribs, destroys the vertebrae, and injures the spinal marrow, so that the patient suffers a species of death, somewhat less violent and sudden. But, although aneurisms in the chest do sometimes present at the back, a circumstance, that depends on the particular situation of the disease, (see *Pelletan's Clinique Chirurgicale*, Tom. 1, Obs. 7, p. 84.), they more commonly rise towards the upper part of the breast, where a throbbing tumour occurs, which has caused an absorption of the opposing parts of the ribs and sternum; and sometimes dislocated the clavicles. The swelling now pulsates in an alarming way. The blood is only retained by a thin covering of livid skin, which is becoming thinner and thinner. At length, a point of the tumour puts on a more conical, thin, and inflamed appearance than the rest; a slough is formed, and, on this becoming loose, the patient is instantaneously carried off by a sudden gush of blood.

A singular case of aneurism of the aorta is related by Dr. C. W. Wells. The disease, being unattended with any external swelling, it seems, was not known with certainty during the patient's lifetime.

The following is an abstract of the symptoms, and particulars of the case. Mr. A. B. a gentleman, thirty-five years of age, and temperate in his habits, became affected in 1789 with symptoms, which were thought to denote the approach of pulmonary consumption. These, however, after some time, entirely disappeared. In 1798, he was attacked with a slight hemiplegia, from which he also recovered, with the exception of an inconsiderable sense of coldness in the foot, which had been paralytic. In March 1804, he complained of being frequently troubled with a noise in his ears, flatulence in his bowels, and pains in his hands and feet, sometimes attended with slight swellings in the same parts. From one, or more of these symptoms, he was never afterwards quite free; but, he did not complain of any unusual feelings in his chest. August 11, 1807, he fatigued himself considerably with walking; ate rather a hearty dinner; and, having refreshed himself with some sleep afterwards, he played about with his children. While thus amusing himself, he was suddenly seized, between eight and nine o'clock, with great oppression in his chest. He soon afterwards became sick, and, in the matter thrown up, some streaks of blood were observed. He now went to bed; but, though the weather was warm, and he was covered with bed-

clothes, his skin felt cold to the attendants. At midnight he laboured under a constant cough, and expectorated mucus tinged with blood. His body was moistened with a cold sweat, and his pulse was extremely feeble; sometimes, it was scarcely perceptible. About five in the morning, his pulse was feeble and irregular; his breathing difficult, his skin pale, cold, and covered with a clammy sweat. He frequently tossed, and writhed his body, as if he was suffering great pain or uneasiness. The mental faculties, however, seemed unimpaired. Shortly, afterwards, he expired, having complained, just before his death, of much heat in his chest, and thrown off the bed-clothes.

The most remarkable circumstance found on opening the body, is thus recorded: "The ascending aorta was distended to about the size of a large orange. The tumour adhered to the pulmonary artery, just before its division into the right and left branches. Within the circumference of this adhesion, there was a narrow hole, by means of which a communication was formed between the two arteries."

Dr. Wells concludes with observing, that, though such a disease might easily have been imagined, he has found no instance of it in books, and that it has not been observed by any of the surgeons, or anatomists in London. He supposes, that the communication, between the aorta and pulmonary artery, took place on the evening before the patient's death, when the oppression in the chest was first felt; and that, in consequence of the superior strength of the left side of the heart, a part of the blood, which was thrown into the aorta, must have been forced into the pulmonary artery, from which circumstance, he conjectures most of the symptoms originated. (*Trans. of a Society for the Improvement of Med. and Surgical Knowledge*, Vol. 3, p. 85.)

The bursting of an aneurism of the aorta into the pulmonary artery is then another possible mode, in which the disease may prove fatal.

It is well worthy of notice, that aneurisms of the arch of the aorta may occasion a tumour, so much like that of a subclavian aneurism, as to be in danger of being mistaken for the latter disease. An example of this kind is related by Mr. Allan Burns, "a case," says he, "on which several of the most distinguished practitioners in Edinburgh, and almost every surgeon in Glasgow were consulted. The nature of the disease appeared to be so decided, and its situation in the subclavian artery so clear, that, on that subject, there was no difference of opinion.

Some were, however, of opinion, that an operation might be performed, while others were fully convinced, that the case was hopeless. For myself, I must confess, that I was firmly persuaded, that, in the early stage of the disease, an operation might have been beneficial," &c. (*Surgical Anatomy of the Head and Neck*, p. 30.) After death, the vessel, which was supposed to have been most materially affected, was found perfectly healthy.—(P. 39.)

After detailing all the particulars of this interesting case, Mr. A. Burns observes, that, "it corroborates Mr. Astley Cooper's remark, that aneurism of the aorta may assume the appearance of being seated in one of the arteries of the neck; an inference, drawn from the examination of a case, which came under his own observation, and of which he had the goodness to transmit a short history to me, along with a sketch, illustrative of the position of the tumour. In one case, the aneurism was attached to the right side of the aortic arch, and involved a part of the arteria innominata; in Mr. Cooper's, the tumour arose from the left side of the arch, from between the roots of the left subclavian, and carotid arteries. It formed a florence-flask-like cyst, the bulbous end of which projected at the root of the neck, from behind the sternum, and so nearly resembled aneurism of the root of the carotid artery, that the practitioner, who consulted Mr. Cooper, actually mistook the disease for carotid aneurism." (*Allan Burns, Op. cit.* p. 41.)

As we have already noticed, aneurisms of the aorta are most frequent at its curvature; but, they are also met with on the other portion of this vessel in the thorax, and likewise on that part of it, which is below the diaphragm. In subjects, predisposed to aneurisms, such swellings are frequently seen affecting various parts of the aorta at the same time.

When the disease occurs in the abdominal aorta, a preternatural pulsation generally becomes perceptible at some point of the parietes of this part of the body. The pressure of the tumour interferes with the functions of the viscera; the breathing is rendered difficult by the swelling resisting the descent of the diaphragm; the patient suffers at times excruciating internal pains; sometimes he is affected with costiveness; sometimes, with diarrhoea; and, not unfrequently, with incontinence of the urine and feces. At length, an immense external swelling is formed, which pulsates alarmingly, and, if the patient survives long enough, destroys him by a sudden external, or internal effusion of blood.

Aneurisms, within the thorax and abdomen, being entirely out of the reach of operative surgery, have been too commonly abandoned as unavoidably fatal, and when any thing has been done in such cases, it has generally been only with a view of palliation. Moderating the force of the circulation by bleedings and low diet, avoiding every thing that has the least tendency to heat the body, or quicken the motion of the blood, keeping the bowels well open with laxative medicines, and lessening pain with opiates, have been the means usually employed. Of late years, also, the digitalis, which has a peculiar power of diminishing the action of sanguiferous system and impetus of the blood, has been prescribed, with every appearance of benefit.

It was the opinion of the celebrated Valsalva, that the utility of a lowering plan of treatment might do more, than merely retard the death of aneurismal patients. It was his belief, that the method might entirely cure such aneurisms as had not already made too much progress, and he put it into practice with such rigour and perseverance, that the treatment became considered as particularly his own. The plan, alluded to, is not described in his writings; but, was published in the first volume of the Commentaries of the Academy of Bologna, by Albertini, one of his fellow students; and several persons, who had learnt this method of Valsalva, afterwards imparted it to others. Thus, as Morgagni was passing through Bologna, in 1728, Stancazi, a physician of that place, is said to have informed him of Valsalva's practice.

After taking away a good deal of blood by venesection, Valsalva used next to diminish the quantity of food gradually, till the patient at length was allowed only half a pint of soup in the morning, a quarter of a pint in the evening, and a very small quantity of water, medicated with mucilage of quinces, or with the lapis osteocolla. When the patient had been so reduced, as to be incapable of getting out of his bed, Valsalva used to give him more nourishment till this extreme debility was removed. Valsalva was sure, that some aneurisms, thus treated, had got well, because every symptom disappeared, and his conviction was verified by an opportunity, which he had of dissecting the body of a person that had been cured of this disease, and afterwards died of another affection; for, the artery, which had been dilated, was found contracted and in some degree callous.

Morgagni relates, that this method of treating aneurisms, is somewhat like the plan, which Bernard Gengha tried with

success, as well as Lancisi, and he refers us to the 24th chapter of the 2nd. vol. of the Anatomy of the one, and to lib. 2, cap. 4, of the Treatise on the Heart and Aneurisms, of the other. But, Sabatier tells us, that, in consequence of this instruction, he examined both these works, without finding any thing on the subject. However this may be, we are informed by the latter, that he has seen the good effects of the practice in an officer, who had an alarming aneurism in front of the humeral extremity of the clavicle, in consequence of a sword wound in the axilla. The patient, after having been bled several times, was confined to his bed, and kept to an extremely low diet. He was allowed, as drink, only a very acid kind of lemonade. He took pills containing alum, and the swelling was covered with a bag, full of tan mill dust, which was every now and then well wet with port wine. By a perseverance in this treatment, the swelling was reduced to a smallish hard tubercle, having no pulsation, and a perfect cure ensued. (See *Sabatier's Médecine Opératoire*, Tom. 3, p. 170—172.)

A French surgeon, named Guérin, has written in favour of the efficacy of applying ice water, or pounded ice to aneurismal swellings; a plan, which he represents, as being often of itself sufficient to effect a cure. This topical employment of cold applications may be rationally and conveniently adopted in conjunction with Valsalva's practice.

The most interesting and convincing facts, in proof of the efficacy of this mode of treatment, have been lately published at Paris by M. Pelletan. Indeed, upon the whole, I have no hesitation in saying, that I have never read any modern collection of surgical cases, which have appeared to me more valuable, than those which compose the *Clinique Chirurgicale* of this experienced writer. The following extract from a well written critique on this work will serve to convey to the reader some idea of the important information contained in the memoir on internal aneurisms. "The intent in the treatment is to reduce the patient gradually to as extreme a degree of weakness, as is possible, without imminently endangering life. It is done by absolute rest, a rigorous diet, and bleeding; to these means, M. Pelletan adds the external application of ice, or cold and astringent washes, &c. He has here detailed many cases from his own practice, of partial, or complete success, which cannot be too generally known, as they may be the means of creating in some, and of confirming in others, a good opinion of the only method of treatment, which has been found at all

efficacious in a dreadful and not unfrequent organic disease.

"Of the cases here recorded, some appear to have been cured; in others, the treatment had marked good effects. In extreme cases, at best, it afforded but partial and temporary relief. We can notice but a few of these cases, which are, in every respect, highly interesting. In one, a robust man, an aneurism at the root of the aorta, with a pulsating tumour of the size of an egg, projecting between the ribs, (the edges of which were already partly absorbed) was reduced, so as to recede within the ribs in the course of eight days. At the end of this time, the patient refused to submit any longer. The tumour did not appear again for nearly a year, although he returned to very drunken and irregular habits. He died in about two years and a half, with the tumour again appearing, and much increased in volume. The aneurismal sac communicated with the aorta by a smooth and round opening, opposite to one of the sigmoid valves. There can be no doubt of the efficacy of the treatment in this case; and it is highly probable, that his health and his life might have been long preserved, but for his own indiscretion. In a case somewhat similar, but not so far advanced, the patient appears to have been cured. There was a swelling on the right side of the breast, about six inches in circumference, with a very strong beating. The pulsation was accompanied by a pain, which stretched towards the scapula and the occiput. It was evident, that the disease was an aneurism of the great arch of the aorta. The patient was a trier, of a strong frame, who was accustomed to drink freely. In the four first days, he was bled eight times, drawing three dishes, "palettes" in the morning, and two in the evening. On the fifth, the pains and the beating were much lessened, but the pulse was still full. He was again bled once. The pulse was in a favourable state, as to strength till the seventh day, when it again rose, and the man was twice bled.

During this time, the man was kept to a most rigorous diet. A cold poultice of linseed and vinegar was placed on the tumour, and renewed when it became warm. At the end of eight days, the good effects of this plan were very evident, the pain and the pulsation were gone. The patient, though weak, was in health and tranquil. He was now allowed more food by degrees. At the end of four weeks from the commencement of the treatment, he left the Hôtel Dieu well. He afterwards led a sober life, became fatter than before, without any vestige of disease, except a slight and deep pulsation at the

part, in which the aorta may always be felt beating in its natural state. He died, two or three years after, of another complaint. His death was not known, and the body was not examined." (See *London Med. Review*, Vol. 5, p. 123.)

M. Pelletan also cured by similar treatment a large axillary aneurism, which was regarded as beyond the reach of operative surgery. On the thirteenth day, the patient was reduced to a degree of weakness, which alarmed many of the observers. From that time, all pulsation in the tumour ceased. The contents were gradually absorbed; and the patient returned to his former laborious life with his arm as strong as ever. The pulse at the wrist was lost, in consequence of the obliteration of the axillary artery, and the limb only receiving blood through the branches of the subclavian artery. *Il y a beaucoup d'exemples d'aneurismes guéris spontanément et sans le secours de l'art; (says Pelletan) mais on ne peut leur comparer le cas que nous venons de décrire; l'état extrême de la maladie, l'énergie des moyens employés, et l'effet immédiat et successif qui en est résulté, prouvent assez que le succès a été dû tout entier à l'art.*" (*Clinique Chirurgicale*, Tom. 1, p. 80.)

In this work, we find not less than three cases, in which aneurism of the aorta is stated to have been effectually cured. One instance was greatly relieved; but, the disease returned, the next year, in consequence of the patient's intemperate mode of life. In another example, an aneurism at the origin of the aorta was cured; but, the disease recurred in another part of that vessel further from the heart. Even such cases, as proved incurable, to the number of fourteen, all received various degrees of palliation from the treatment adopted.

I shall now proceed more particularly to the consideration of aneurisms, which may be cured by a surgical operation, and, here, we shall be fully satisfied, that "*l'art de guérir ne triomphe jamais plus heureusement que lorsqu'il peut employer la médecine efficace, c'est à dire, les moyens chirurgicaux ou opératoires.*" (*Clinique Chirurgicale*, Tom. 1, p. 110.)

OF THE POPLITEAL ANEURISM, AND OPERATION FOR ITS CURE.

The practice of tying arterics, wounded either by accident or in the performance of surgical operations, and even the plan of tying the humeral artery for the cure of the aneurism at the bend of the arm, were known long before the operation for the relief of the popliteal aneurism was attempted. The considerable size of the

femoral artery; its deep situation, the urgent symptoms of the disease, and ignorance of the resources of nature for transmitting blood into the limb, after the ligation of the vessel, are the circumstances, which appear to Pelletan to have deterred former surgeons from this operation. Valsalva, indeed, had treated popliteal aneurisms on the debilitating method, and has adduced one or two equivocal proofs of its success.

In Pelletan's first memoir on aneurism, and in the third vol. of Sabatier's *Médecine Opératoire*, as I have already stated, are two cases of axillary aneurisms, which were cured by Valsalva's treatment. But, encouraging as such examples may be, experience is not yet sufficiently favourable to this practice to allow it to bear a comparison, in point of efficacy, with the surgical operation, or to justify the general rejection of this last more certain means of cure. As Pelletan admits, Valsalva's treatment is extremely severe; the event of it is doubtful; and, should it not be found to answer, it is questionable, whether the patient would be left in a condition to bear the operation, for the success of which, it seems necessary, that, a certain strength of vascular action should exist in order that the blood may be freely transmitted through such arterial branches, as are to supply the place of the main trunk, after this last has been tied.

The time, therefore, has not yet arrived, when surgical operations for the relief of aneurism should be relinquished. (*Pelletan, Clinique Chirurgicale*, Tom. 1, p. 114, 115.)

The cure of popliteal aneurisms by means of compression is occasionally effected; but, it happens too seldom to claim a great deal of confidence, or to lessen in any material degree the utility and importance of operative surgery in this part of practice. Pelletan records the cure of one popliteal aneurism by compression and absolute repose, during eleven months (*Tom. 1, p. 115.*) and other examples might be cited, were it necessary.

Aneurisms in general, and, among them, the popliteal case, are all attended with some little chance of a spontaneous cure; yet, this desirable event is too uncommon to be a judicious reason for postponing the operation, especially, as it is the usual course of the disease to continue to increase, the cure in the early stage may be more speedily accomplished, and the experience of modern operators leaves no room for apprehending that the anastomoses will not suffice for the due nourishment of the leg, and, consequently, proves, that waiting for the enlargement of the collateral vessels to take place, is alto-

gether an unnecessary and ineligible method. Popliteal aneurisms, as well as other external tumours of the same nature, stand the best chance of a spontaneous cure, when any cause induces a general, violent, and deep inflammation all over the swelling; for, then, the communication, between the sac and artery, may possibly become closed with coagulating lymph, and the pulsation of the tumour be suddenly and permanently stopped. If, in this state, the disease sloughs, and the patient's constitution holds out, the coagulated blood in the sac and the sloughs, are gradually detached, leaving a deep ulcer, which ultimately heals. An example, in which a popliteal aneurism seems to have been cured by such a process, is related in the *Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge*, Vol. 2, p. 268.

After what has been stated, it is almost unnecessary to say, that, in former times, when all hopes of curing a popliteal aneurism by Valsalva's method, by compression, or a natural process, were at an end, amputation of the limb was considered as the sole and necessary means of saving the patient's life. In modern times, a great and beneficial change of opinion has taken place upon this subject, and not only may the patient's life be in general saved, but his limb also, and this without any operation, that can be compared with amputation, in regard to severity.

It is alleged, that Teislere, Molinelli, Guattani, Mazotti, and some other celebrated Italian surgeons, were the first, who ventured to tie the popliteal artery for the cure of aneurism. The path, as Pelletan remarks, had been pointed out to them by Winslow and Haller, whose valuable descriptions and plates of the arterial anastomoses about the knee joint, shewed by what means the lower part of the limb would be nourished, after a ligature was made on the principal arterial trunk. For almost thirty years, however, the practice of tying the popliteal artery was confined to the Italian surgeons. Pelletan believes, that he was the first, who attempted such an operation at Paris nearly thirty years ago, (alluding to about the year 1780, the *Clinique Chirurgicale* being dated 1810.)

However, this operation of opening the tumour and tying the popliteal artery itself, was a severe and often a fatal proceeding, and does not admit of being compared with the Hunterian operation, in point either of simplicity, safety, or success, as I shall explain, after a few particulars relating to the popliteal aneurism have been detailed.

On whatever side of the artery the tu-

mour is produced, it can be plainly felt in the hollow between the hamstrings, and its nature is as easily ascertained by the pulsation in every part of the tumour. Though the disease may, perhaps, not occur in the popliteal artery so often as in the aorta itself, yet, it certainly is seen more frequently in the former vessel, than any other branch, which the aorta sends off. As Mr. Home has observed, this circumstance has never been satisfactorily explained, and, what is rather curious, in many recent instances of this disease, the patients have been coachmen and postilions. Morgagni found aneurisms of the aorta most frequent in guides, post-boys, and other persons, who sit almost continually on horseback. This he imputes to the concussion and agitation, to which they are exposed.

When we contemplate the effects of various postures of the leg and thigh on the popliteal artery, and the obstruction, which the circulation in it must experience, when the knee is in a state of flexion, we perceive an assignable cause, why this artery should be so often diseased. This account is, in some degree, strengthened by aneurisms of the aorta itself, occurring more frequently at its curvature, than any other part. (*Home in Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge*, Vol. 1.)

The popliteal aneurism is generally supposed to arise from a weakness in the coats of the artery, independently of disease. If this were true, we might reasonably conclude, that, except at the dilated part, the vessel would be sound. Then the old practice of opening the sac, tying the artery above and below it, and leaving the bag to suppurate and heal up, would naturally present itself. Mr. Hunter finding, that the arterial coats were altered in structure higher up, than the tumour, and that the artery, immediately above the sac, seldom united when tied; but, that, when the ligature came away, the bleeding destroyed the patient; concluded, that some disease affected the coats of the vessel, before the actual occurrence of the aneurism. Dissatisfied with Haller's experiments on frogs, shewing that weakness alone could give rise to aneurism, he tried what would happen in a quadruped, whose vessels were very similar in structure to the human. Having denuded above an inch of the carotid artery of a dog, and removed its external coat, he dissected off the other coats, layer after layer, till what remained was so thin, that the blood could be seen through it. In about three weeks, the dog was killed, when the wound was found closed over the artery, which was

neither increased, nor diminished in size.

It being conjectured, that aneurism was perhaps, prevented, by the parts being immediately laid down on the weakened portion of the artery, Mr. Home stripped off the outer layers of the femoral artery of a dog, placed lint over the exposed part of the vessel to keep it from uniting to the sides of the wound, and, in six weeks, killed the animal, and injected the artery, which was neither enlarged, nor diminished, and its coats had regained their natural thickness and appearance.

These experiments strengthened Mr. Hunter's belief, that aneurismal arteries are diseased; that the morbid affection frequently extends a good way from the sac along the vessels; and that the cause of failure in the old operation, arose from tying a diseased artery, which was incapable of uniting, before the separation of the ligature.

Mr. Hunter's reflections led him to propose taking up the artery in the anterior part of the thigh, at some distance from the diseased portion, so as to diminish the risk of hemorrhage, and be enabled to get at the vessel again, in case it should bleed.

The flux of blood into the sac being stopped, he concluded, the sac and its contents would be absorbed, and the tumour gradually disappear, so as to render any opening of the sac unnecessary.

The first operation of this kind, ever done, was performed on a coachman, by Mr. Hunter, in St. George's Hospital, December, 1785. An incision was made on the anterior and inner part of the thigh, rather below its middle, which wound was continued obliquely across the inner edge of the sartorius muscle, and made large, in order to facilitate doing whatever might be necessary. The fascia, covering the artery, was then laid bare, for about three inches, after which the vessel itself could be plainly felt. A cut, about an inch long, was then made through this fascia, along the side of the artery, and the fascia dissected off. Thus the vessel was exposed. Having disengaged it from its connexions with the knife and a thin spatula, a double ligature was put under it, by means of an eye probe. The doubled ligature was then cut, so as to make two separate ones. The artery was now tied with both these ligatures, but, *so slightly as only to compress the sides together*. Two additional ligatures were similarly applied a little lower, with a view of compressing some length of artery, so as to make amends for the want of tightness, as it was wished to avoid great pressure on any one part of the

vessel. The ligatures were left hanging out of the wound, which was closed with sticking plaster. On the second day, the aneurism had lost one-third of its size, and, on the fourth, the wound was every where healed, except where the ligatures were situated. On the ninth, there was a considerable discharge of blood from the apertures of the ligatures, but it ceased on applying a tourniquet and did not recur. On the fifteenth day, after the operation, some of the ligatures came away, followed by a small quantity of matter, and about the latter end of January, 1786, the man went out of the hospital, the tumour having become still less. In the course of the spring, some abscesses in the vicinity of the cicatrix followed, and some pieces of ligature were discharged, from time to time. In the beginning of July, a piece of ligature, about one inch long came away, after which the swelling went off entirely, and the man left the hospital again on the 8th, perfectly well, there being no appearance of swelling in the ham.

This subject died of a fever in March, 1787, and, on dissection, the femoral artery was found impervious from the giving off of the arteria profunda down to the place of the ligature, and an ossification had taken place for an inch and a half along the course of this part of the vessel. Below this portion, the vessel was pervious, till just before it came to the aneurismal sac, where it was again closed. What remained of the sac was somewhat larger than a hen's egg, and it had no remains of the lower opening into the popliteal artery. The rest of the particulars of this dissection are very interesting. (See *Med. and Chir. Trans. Vol. 1. p. 153.*)

This celebrated case led to the knowledge, that simply taking off the force of the circulation is sufficient to cure an aneurism, the tumour being then taken away by absorption.

To confirm the fact, Mr. Home relates a case of femoral aneurism, which got well without an operation, but, on the same principle. A trial of pressure had been made, without avail. The tumour became very large, and such inflammation took place in the sac and integuments, that mortification seemed impending. In this state, no pulsation could be felt in the tumour, or the artery above it. A coagulum, which we know always occurs in an artery previously to mortification, seemingly to prevent bleeding, probably formed in this instance, and kept the blood from entering the sac. (*Home.*)

Mr. Hunter's second operation was on

a trooper. Instead of using several ligatures, which were found hurtful, he tied the artery and vein with a single strong one; but, unluckily, made the experiment of dressing the wound from the bottom, instead of uniting it at once: the event was, the man lost a good deal of blood, and died.

After this, Mr. Hunter's practice was to tie the artery alone with one strong ligature, and unite the wound as speedily as possible.

Since the time of Hunter, several innovations, and some considerable improvements in the mode of operating have been proposed.

The peculiarity in Mr. Abernethy's first operation consisted in applying two ligatures round the artery, close to where it was surrounded with its natural connexions. For this purpose, he passed two common sized ligatures beneath the femoral vessels, and having shifted one upwards, the other downwards, as far as these vessels were detached, he tied both the ligatures firmly.

The event of this case was successful. An uneasy sensation of tightness, however, extending from the wound down to the knee, and continuing for many days after the operation, made Mr. Abernethy determine, in any future case, to divide the artery between the two ligatures, so as to leave it quite lax.

Mr. Abernethy next relates a case of popliteal aneurism, for which Sir Charles Blinck operated, with the innovation of dividing the artery between the ligatures. The man did not experience the above kind of uneasiness; and no hemorrhage ensued when the ligatures came away, although there was reason to think, that the whole arterial system had a tendency to aneurism, as there was also another tumour of this kind in the opposite thigh.

Mr. Abernethy has referred bleeding, after operations for aneurisms, to two causes; viz. 1st. the inflammation and ulceration of the artery; 2dly. the want of union between the sides of the vessel. When an artery is laid bare, and detached from its natural connexions, and the middle of such detached portion tied with a single ligature, as was Mr. Hunter's practice, it is observed by Mr. Abernethy, that the vessel, so circumstanced, must necessarily inflame, and be very likely to ulcerate. The occurrence of bleeding led to a practice, which this gentleman justly censures, viz. applying a second ligature above the first, and leaving it loose, but ready to be tightened, in case of hemorrhage. As the second ligature, however, must keep a certain portion of the artery

separated from the surrounding parts, and must, as an extraneous substance, irritate the inflamed vessels, it must make its ulceration more apt to follow. For the same reason, Mr. Abernethy thinks pieces of wood, cork, &c. hurtful, and when employed with a view of hindering the ligature from cutting completely through the artery, their interposition is not necessary, as such an accident scarcely ever occurs, and, as they would prevent the ligature from dividing the inner and muscular coat, (See *Hemorrhage*) they would tend to prevent the adhesion of the opposite sides of the vessel to each other.

When the artery is tied in Mr. Abernethy's manner, and is divided in the space between the ligatures, it becomes quite lax, possesses its natural attachments, and is, as nearly as possible, in the same circumstances as the femoral artery is, when tied on the surface of a stump. (See *Surg. and Physiol. Essays by J. Abernethy.*)

Notwithstanding Scarpa has excelled other writers so much, in his description of the anatomy and formation of aneurisms, his practice in regard to the operation, is certainly far inferior to Mr. Abernethy's, and that of practitioners in general in this country. His interposing a cylindrical roll of linen, between the artery and knot of the ligature, and his not bringing the sides of the wound together immediately after the operation, are particularly objectionable parts of his method.

There is one excellence, however, in Scarpa's mode of operating, which I think will soon obtain the universal approbation of the surgical profession; he prefers making the incision in the upper third of the thigh, or a little higher than the place where Mr. Hunter used to make the wound. His reason for this, is to avoid the necessity of removing the sartorius muscle too much from its position, or of turning it back, to bring the artery into view, so as to be tied. I have seen the best operators embarrassed, by having the sartorius muscle immediately in their way after the first incision, and as the vessel is more superficial a little higher up, the place is further from the diseased part of the artery, and there is no hazard of the anastomoses failing to keep up the circulation; this part of Scarpa's practice is highly deserving of imitation.

It will in no manner diminish the merit of those men, who have successfully laboured to improve the present part of the practice of surgery, to state, that the most ancient surgeons seem to

have known and practised some of the chief things, upon which the superiority of the plan now adopted appears principally to depend. Such methods having quite sunk into oblivion, and John Hunter not being one who pried into old works, his innovations claim all the honour due to the strictest originality. It is a fact, worthy of notice, that the Greeks were acquainted with the practice, lately recommended, of tying and dividing the trunk of the artery high above the tumour, as will appear from the following extract: (*Ætii. 4 Serm. Tetr. 4. cap. 10.*) *At vero quod in cubiti cavitate fit aneurisma, hoc modo per chirurgiam aggredimur: primum arteria superne ab ala ad cubitum per internam brachii parte simplicem sectionem, tribus, aut quatuor digitis infra alam, per longitudinem facimus, ubi maxime ad tactum arteria occurrit: atque ea paulatim demodata, deinceps incumbentia corpuscula sensim excoriamus ac separamus, et ipsam arteriam cæcuncino attractum duobus fili vinctulis probe adstringimus, medianque inter duovinctula dissecamus; et sectionem poline thuris explemus, ac linamentis inditis congruas deligationes adhibemus.* Afterwards we are directed to open the aneurismal tumour at the bend of the elbow, and when the blood has been evacuated, to tie the artery twice, and divide it again. If the ancients had only omitted the latter part of their operation, they would absolutely have left nothing to be discovered by the moderns. What a striking example of the bold manner in which our forefathers have acted, without being guided by the lights of anatomy and physiology! But there are two or three passages in Galen, Celsus, and Hippocrates, from which we may suspect, that even Ætius himself was not the inventor of this operation, &c. See also *Paul. Ægin. lib. 6. cap. 37.* (*Rees' Cyclopædia, Art. Aneurism.*)

The French surgeons of the present day are exceedingly jealous about the improvements, which British practitioners have been the means of introducing into this branch of surgery. Pelletan declares, that, with regard to dividing the artery between the ligatures, his countryman M. Tenon, used to advise this practice forty years ago. (*Clinique Chirurgicale, Tom. 1, p. 192.*) Yet we find that M. Tenon himself must give up the claim of priority to Ætius, and other ancients. The merit of the thing appears to me to consist in the revival of the practice, and in insisting on its advantages, with sufficient stress to make it extensively approved.

M. Richerand seems also offended, that Hunter's name should be affixed to

an operation, which he conceives was in reality the invention of Guillemeau. Here we observe, Ætius again puts in a prior claim, and, with much more effect, because his operation truly resembled Mr. Hunter's, inasmuch as it was done at some distance above the swelling, while Guillemeau only tied the artery close above the disease, and opened the swelling, a serious deviation from the Hunterian practice.

Guillemeau (says Richerand) a contemporary, and disciple of Ambrose Paré, having to treat a tumour of blood, at the bend of the arm, in consequence of bleeding, exposed the artery above the tumour, tied this vessel, then opened the sac, took out the coagulated blood contained in it, and dressed the wound, which healed by suppuration. After more than a century, Anel, on being consulted about a similar case, tied the artery above the swelling, but left this to itself. The pulsations ceased, the tumour became smaller, and hard, and after some months, no traces of the disease were perceptible.

In 1785, Desault operated in the same manner for a popliteal aneurism: the swelling diminished by one half, and the throbbings ceased; on the 20th day, it burst, coagulated blood and pus were discharged in large quantities, and the wound, after continuing a long time fistulous, at length healed. Towards the end of the same year, says Richerand, Hunter applied the ligature somewhat differently; instead of placing it close to the swelling, or directly above it, he put it on the inferior part of the femoral artery. (*See Richerand's Nosographie Chirurgicale, Tom. 4, p. 98, 99, edit. 2.*)

Unquestionably, M. Anel did in one solitary instance, tie the humeral artery immediately above an aneurism at the bend of the arm, and effected a cure without opening the swelling; but he did not think of applying the plan to the femoral artery, or draw the attention of the French surgeons sufficiently to the matter, to make the latter imitate his operation: on the contrary, the method fell into oblivion, and was never practised. With regard to Desault's operation, said to have been done in an earlier part of 1785, than Mr. Hunter's first operation, it is only necessary to say, that Desault tied the popliteal artery itself, while the grand object in Mr. Hunter's method was to take up the femoral artery, at a distance from the disease, and that it is this last mode alone, which has gained such approbation, and been attended with unparalleled success.

Mr. Astley Cooper has published a case

of popliteal aneurism, in which a particular occurrence happened, that led this gentleman to make a little innovation in the method of tying arteries for the cure of aneurisms.

The femoral artery had been tied with two ligatures, as firmly as could be done without risk of cutting it through. "But, (says Mr. A. Cooper) as I was proceeding to dress the wound, I saw a stream of blood issuing from the artery, and when the blood was sponged away, one of the ligatures was found detached from the vessel. Soon after the other was also forced off, and thus the divided femoral artery was left without a ligature, and unless immediate assistance had been afforded him, the patient must have perished under hemorrhage."

The same kind of accident has occurred in Mr. Cline's practice.

These events naturally induced Mr. A. Cooper to reflect on the means, which were to be employed to obviate them, and the first which suggested itself was to include a larger portion of the artery between the two ligatures. But this plan was given up, when it was recollected, that many branches of arteries must be divided, and that it was a mode of security (if it was so) which could only apply to particular cases of aneurism, since in some situations of that disease, there is scarcely any length of vessel between the tumour and a principal anastomosing branch of the artery.

Mr. A. Cooper thinks, that a plan of greater security, and more general application, consists in conveying the ligatures, by means of two blunt needles under the artery, an inch asunder, and close to the coats of the vessel, excluding the vein and nerve, but passing the threads through the cellular membrane surrounding the artery. When these are tied, and the artery is divided between them, the ligatures will be prevented from slipping from the artery by the cellular membrane through which they are passed. Mr. A. Cooper next relates a case of aneurism after bleeding, which he cured by this way of operating.

"But although this plan, as to the event, answered my expectations, yet a different mode of securing the ligature, suggested to me by my young friend Mr. H. Cline, struck me so forcibly for its simplicity and security, that I felt immediately disposed to adopt it."

Mr. A. Cooper put the new plan to the test of experiment in operating for a popliteal aneurism on Henry Figg, aged 29. "An incision being made on the middle of the inner part of the thigh, and the femoral artery exposed, the artery

was separated from the vein and nerve, and all the surrounding parts, to the extent of an inch, and an eye-probe, armed with a double ligature, having a curved needle at each end, was conveyed under the artery, and the probe cut away. The ligature nearest the groin was first tied; the other was separated an inch from the first, and tied also. Then the needles were passed through the coats of the artery, close to each ligature and between them. The thread they carried, was tied into the knot of the ligature, which had been already secured around the vessel; and thus a barrier was formed in the artery, beyond which the ligature could not pass." The event of this operation was successful. (*Med. and Phys. Journ. Vol. 8.*)

Upon the foregoing proposal a few observations are necessary, and these I shall offer with due deference to the eminent character, whose fame alone has attached undue importance to the innovation.

In the first place I shall prove that Mr. H. Cline's proposal is not an original one. It appears to have been mentioned by Dionis, and to have been noticed by some subsequent writers. In the 13th chapter, on hemorrhage, in Richter's *Anfangsgrunde der Wundarzneykunst*, we read the following passage. *Die hervorgezogene Schlagader umwickelt man mit dem gewöhnlichen Faden zweymal, befestigt denselben mit einem Knoten, zieht darauf, wenn die Schlagader gross ist, mittelsteiner Nadel ein ende des Fadens vor der Unterbindung durch dieselbe, knüpft beyde Enden zusammen, und lässt sie wie gewöhnlich herabhängen. Dritte Auflage. 1799.* "The artery, when drawn out, is to be twice surrounded with the common ligature. This is to be tied in a knot, and when the artery is large, one end of the ligature is to be passed, by means of a needle, through the vessel before the knot, then both ends are to be tied together, and left hanging out of the wound, as in the ordinary way." Edition 3. 1799. In making this quotation, my object is to remove the supposition, that the world is indebted to Mr. H. Cline for the suggestion, if we may use the term indebted, when the plan has certainly very little merit, and would undoubtedly never have acquired much celebrity, had not Mr. A. Cooper's name been coupled with it.

What power can possibly force the ligature, when tied with due tightness, off the extremity of the vessel? If Mr. A. Cooper had reflected a little, he would have seen, that no action of the heart, or artery itself, no turgid state of this vessel, could do so. If a piece of string were tied round any tube for the purpose of

preventing a fluid from escaping from its mouth, provided the string is applied with due tightness, no fluid can possibly escape, however great the propelling power may be, supposing that the string, and structure of the tube, do not break. If the ligature be applied so slackly as to slip, who can doubt, that a hemorrhage will still follow, even though the ligature is carried through the end of the vessel, and tied in the way mentioned above.

In the case, in which the ligature slipped off, as mentioned by Mr. A. Cooper, we must, therefore, conclude that the arteries were not tied with a sufficient tightness, perhaps through an unfounded fear that a ligature, might cut its way completely through all the coats of an artery. The inner coats of the artery we know, from the experiments of Dr. Jones, are invariably cut through when the vessel is properly tied, and the circumstance is always useful in promoting its closure.

OF ANEURISMS HIGH UP THE FEMORAL ARTERY.

Mr. Abernethy has been called upon in at least four cases to take up the external iliac artery. The events of all these have shewn, that the anastomosing vessels were fully capable of conveying blood enough into the limb below, and that a vessel even of this size could become permanently closed after being tied. Messrs. Freer and Tomlinson, of Birmingham, have both also done the same operation with success. Our limits, however, will only allow us to describe the operation, and the particulars must be consulted in *Abernethy's Surg. and Physiol. Essays; his Surgical Observations*, 1804; *Edinb. Med. and Surg. Journal for January*, 1807; and *Freer's Observations on Aneurism*, 1807.

In Mr Abernethy's first operation of this kind, an incision, about three inches in length, was made through the integuments of the abdomen, in the direction of the artery, and thus the aponeurosis of the external oblique muscle was laid bare. This was next divided, from its connexion with Poupart's ligament, in the direction of the external wound, for the extent of about two inches. The margins of the internal oblique and transverse muscles being thus exposed, Mr. Abernethy introduced his fingers beneath them to protect the peritoneum, and then divided them. Next he pushed this membrane with its contents upwards and inwards, and took hold of the external iliac artery with his finger and thumb. It now only remained to pass a ligature round the

artery, and tie it; but, this required caution, on account of the contiguity of the vein to the artery. These Mr. A. separated with his fingers, and introducing a ligature under the artery with a common surgical needle, tied it about an inch and a half above Poupart's ligament. (*Surg. Essays*.)

The following was the method Mr. Abernethy adopted the second time of tying the external iliac artery.

An incision of three inches in length was made through the integuments of the abdomen, beginning a little above Poupart's ligament, and being continued upwards; it was more than half an inch on the outside of the upper part of the abdominal ring, to avoid the epigastric artery. The aponeurosis of the external oblique muscle being thus exposed, was next divided, in the direction of the external wound. The lower part of the internal oblique muscle was thus uncovered, and the finger being introduced below the inferior margin of it and of the transversalis muscle, they were divided with the crooked bistoury for about one inch and a half. Mr. Abernethy now introduced his finger beneath the bag of the peritoneum, and carried it upwards by the side of the psoas muscle, so as to touch the artery about two inches above Poupart's ligament. He took care to disturb the peritoneum as little as possible, detaching it to no greater extent than would serve to admit his two fingers to touch the vessel. The pulsations of the artery made it clearly distinguishable, but Mr. Abernethy could not get his finger round it with facility. He was obliged to make a slight incision on either side of it, in the same manner as is necessary when it is taken up in the thigh, where the fascia which binds it down in its situation is strong. After this the forefinger could be put beneath the artery, which Mr. A. drew gently down, so as to see it behind the peritoneum. By means of an eye-probe, two ligatures were conveyed round the vessel; one of these was carried upwards as far as the artery had been detached, and the other downwards: they were firmly tied, and the vessel was divided in the interspace between them. (*Surg. Observ.* 1804.)

Mr. Abernethy, in his third instance of tying this vessel, operated exactly as in the foregoing case, and with complete success. (*See Edinb. Surg. Jour. January* 1807.)

Mr. Freer, in his operation, made an incision about one inch and a half from the spine of the ilium, beginning about an inch above it, and extending it downwards about three inches and a half, so

as to form altogether an incision four inches and a half long, extending to the base of the tumour. The tendon of the external oblique being exposed, was carefully opened, and also the internal oblique, when the finger was introduced between the peritoneum and transversalis, and served as a director for the crooked bistoury, which divided the muscle. Avoiding all unnecessary disturbance, Mr. Freer separated the peritoneum with his finger, till he could feel the artery beating, which was so firmly bound down, that he could not get his finger under it without dividing its fascia. The vessel being separated from the surrounding parts, a curved blunt needle, armed with a strong ligature was put under it, and tied very tight, with the intention of dividing the internal coats of the vessel. The operation led to a perfect cure. (*Freer on Aneurism*, p. 83.)

Mr. Tomlinson applied only one ligature, and, of course, left the artery undivided; the event was attended with perfect success.

Since the first edition of this publication, the operation of tying the external iliac artery has been performed in numerous examples, and, I am happy to say, that most of the events of these cases have been highly favourable to a continuance of the practice. Mr. Astley Cooper has taken up this vessel in several instances, and saved his patients from imminent death. Even on the other side of the Atlantic, the operation has now been practised with the most successful consequences. Such facts must be highly gratifying to Mr. Abernethy, through whose judgment and boldness, the method was first suggested and practised. In my opinion, had this gentleman made no other improvement in his profession, this alone ought to crown him with unfading honours. The practice seems to astonish our neighbours, who appear almost to withhold their belief: "*Lorsqu'un aneurisme a commencé vers la partie la plus élevée de la crurale, au moment même où elle vient de sortir de l'abdomen, peut-on se permettre d'inciser la partie inférieure de cette cavité, de couper l'arcade crurale, et de chercher l'artère iliaque externe, pour l'embrasser par la ligature? S'il en fallait croire des observations insérées dans la Bibliothèque britannique, cette opération hardie aurait été faite avec succès à Londres, par le docteur Abernethy, dans un cas d'anéurisme du commencement de la crurale; en particulier n'hésita pas, dit-on, de pénétrer dans le bassin, en incisant le ligament de Fallope; mais, en mettant de côté la difficulté de l'opération dans laquelle on est obligé de travailler en sous-œuvre, et sans que la vue*

puisse guider l'aiguille, que l'on passe autour du vaisseau, la ligature simultanée, de la veine iliaque, et des nerfs placés sur les côtés du détroit supérieur du bassin, occasionnera la gangrène. Quels vaisseaux continueront à nourrir le membre dans le défaut presque absolu d'anastomoses? Enfin, dans la supposition peu probable, qu'il ne tombât pas en gangrène, des hernies énormes seraient l'inévitable résultat de l'affaiblissement des parois abdominales." (*Richerand, Nosographie Chirurgicale*, Tom. 4, p. 106—107, edit. 2.)

In this passage, M. Richerand is full of error; he supposes an easy operation difficult; he forgets all the anastomosing arteries, which are branches of the internal iliac, and emerge from apertures of the pelvis; and he is impressed with a thorough expectation of gangrene, hernia, &c. which, in fact, have never arisen, in consequence of this operation. But, it is enough to say in reply to this gentleman, that he is arguing against cases, many of which were in public hospitals, and seen by hundreds of spectators.

Some of the cases, on which Mr. Abernethy operated, I was an eyewitness of, and can therefore bear testimony to the ease and simplicity of the necessary operation. The external iliac artery was most readily tied the beginning of the present year, 1812, by Mr. Ramsden, when the aneurismal swelling rose much higher than Poupart's ligament. The patient, it is true, died; but, his age was not less than 70; and, yet, notwithstanding this circumstance, the limb had a full supply of blood, and not the least tendency to gangrene shewed itself.

[The operation was first performed in America, in August 1811, by the editor of the present work. The result was completely successful.—The use of a curved forceps, for the purpose of conveying the needle round the artery, was found to facilitate the operation very greatly.—For a particular account of the case, the reader is referred to Dorsey's Elements of Surgery.]

The many operations, which have now been done on the external iliac artery, have impressed me with a conviction, that, in subjects under a certain age, there is no reason to fear, that the anastomoses, will not suffice for the supply of the lower extremity. I have heard of no instance to the contrary, and, should such an event ever happen, it cannot be common, nor ought it, as, being only an unusual occurrence, to be admitted as a just reason for delay, until the collateral vessels have had time to enlarge. I believe, that, in all aneurismal diseases, early

operating is the best, and most judicious practice. I say this, not without recollecting, that all aneurisms are attended with a chance of getting spontaneously well in time. I saw the inguinal aneurism, which did so, under Mr. Albert, in the York Hospital, but as this also is a rare incident, I do not believe that it ought to influence us against having speedy recourse to an operation. Besides, the cure by inflammation and sloughing, appears to me to be attended in reality with more peril, than a well executed operation, and, consequently, has less recommendations, than many may imagine. Had not Mr. Albert's patient been a very strong man, he would certainly have fallen a victim to the extensive disease, which the bursting and sloughing of the tumour created.

ANEURISMS OF THE BRACHIAL ARTERY, AND THE OPERATION FOR THEM.

Surgical writings contain many histories of aneurisms in the bend of the arm, produced by the puncture of the brachial artery in venesection, or caused by a deep wound inflicted at the bend of the arm, along the inner side of the humerus, or in the axilla. Such cases must indisputably be formed by effusion. Although Morand, &c. have found, that along with aneurisms, caused by a wound of the brachial artery, the diameter of the vessel is sometimes unusually enlarged through its whole length, above the seat of the tumour, this enlargement, which is very rare, might have existed naturally, before the puncture occurred. Even were it frequent, such an equable longitudinal expansion of the tube of the artery could not explain the formation of the aneurismal sac in the bend of the arm, along the inner side of the humerus, or in the axilla, after wounds. (*Scarpa, p. 160.*)

The proximate cause of these cases may invariably be traced to the solution of continuity in the two proper coats of the artery, and the consequent effusion of blood into the cellular substance. The effect is the same, whether from an internal morbid affection, capable of ulcerating the internal and fibrous coats of the artery, the blood be effused into the neighbouring cellular sheath surrounding the artery, which it raises after the manner of an aneurismal sac; or, the wound of the integuments having closed, the blood issue from the artery, and be diffused in the surrounding parts. The cellular substance, on the outside of the wounded vessel is first injected, as in ecchymosis; the blood then distends it, and elevates it in the form of a tumour,

and, the cellular divisions being destroyed, converts it at last into a firm capsule, or aneurismal sac. (*Scarpa p. 167.*)

The circumscribed or the diffused nature of the aneurism, and the rapidity or slowness of its formation, depend on the greater or less resistance to the impetus of the blood, during the time of its effusion, by the interstices of the cellular substance surrounding the artery, and by the ligamentous fasciæ and aponeuroses, lying over the sac. The aponeurosis of the biceps muscle, being only half an inch broad, and situated lower than the common place for bleeding, cannot, at least, in most cases, materially strengthen the cellular substance surrounding the artery, as is commonly supposed. (*Scarpa, p. 168—170.*) This author refers the greatest resistance to the intermuscular ligament, which after having covered the body of the biceps muscle extends over the whole course of the humeral artery, and is implanted into the internal condyle. This ligamentous expansion has a triangular shape, the base of which extends from the tendon of the biceps, to the internal condyle, while the apex reaches upward along the inner side of the humerus towards the os brachii. The humeral artery and median nerve, kept in their situation by the cellular sheath, and this ligamentous expansion run in the furrow, formed between it and the internal margin of the biceps. (*Scarpa, 171.*) This author anatomically explains many circumstances relative to the diffusion, circumscription, shape, &c. of brachial aneurisms, from this intermuscular ligament. While aneurisms, from an internal cause, are not unfrequent in the aorta, thigh, and ham, they are very rare in the brachial artery; but, such instances, however, are recorded. (*Scarpa, 174.*)

The mode of distinguishing a wound of the brachial artery, in attempting to bleed, and the method of trying to effect a cure by pressure, are described in the article *Hæmorrhage*.

Amel is said to have been the first who tied the brachial artery, for the cure of aneurisms in the arm, in the same way that Hunter did the femoral, for the cure of those in the ham, viz. within one ligature above the tumour, without making any incision upon, or into, the sac itself.

The operation is performed as follows:—the surgeon having traced the course of the brachial artery, and felt its pulsations above the aneurism, he may either cut down to the vessel immediately above the tumour, or much higher in the long space between the origins of the superior and inferior collateral arteries. The

integuments are to be divided in the course of the artery, and also the cellular sheath, for the space of about two inches and a half. The surgeon now introducing his left fore-finger to the bottom of the wound, will feel the denuded vessel, and, if it is not sufficiently bare, he must divide the parts which still cover it, observing to introduce the edge of the knife, on the side next to the internal margin of the biceps, to avoid dividing any of the numerous muscular branches, which go off from the opposite side of the artery. He is then to insulate, with the point of his finger, the trunk of the vessel, alone if he can, or together with the median nerve and vein, and raise it a little from the bottom of the wound. He is to separate the median nerve and vein, for a small space from the artery, and with an eyed needle is to pass a ligature under the latter, and then tie it with a simple knot.

Whoever, after these directions, says Scarpa, shall have the treatment of a *circumscribed* aneurism in the bend of the arm, will no longer, it is to be hoped, follow the method of those, who, supposing the tumour to be formed by the dilatation of the artery, used first to divide the integuments over the tumour, insulated the sac, and sought for the vessel above and below the aneurism, in order to tie it in two places; and then endeavoured to make the sac slough away. The operation is now reduced to the greatest simplicity, viz. tying the artery merely above the tumour. (See Scarpa, p. 358, 359.)

When the aneurism is *diffused*, and accompanied with violent inflammation and swelling of the whole arm, from the excessive distention of the clots of effused blood, Scarpa recommends the old operation of opening the tumour, and tying the artery at the bottom of the sac, above and below the wound made by the lancet. In this method it will be proper to apply a tourniquet to the upper part of the arm, near the axilla; or, if the limb should be very painful and swelled, it is better to let an assistant compress the artery from above the clavicle, against the first rib. The incision having been made into the tumour, and the blood discharged, a probe is to be introduced into the puncture in the vessel, from below upwards, so as to raise the artery. This, being separated from the parts beneath, and the median nerve, for a small extent, is to have two ligatures put under it, one of which is to be tied above, the other below, the wound in the vessel. Then the tourniquet, or pressure is to be taken off, and if there be no bleeding, the wound is to be brought together. (See Scarpa, p. 359.)

Having observed, after an operation performed in the common way, by a ligature above and below the aperture in the artery, such violent pain, swelling and inflammation, as threatened gangrene of the limb, and which symptoms, when mitigated, left the arm weak, and with a much more feeble pulse, than in the other arm, this gentleman wished to see the operation done, so as to make less disturbance of the circulation. "I recollected," he remarks, "all that I had seen or read of the effects of styptics, of pressure, and of ligatures, in the cure of hemorrhages. I considered the coats and motions of arteries, and compared their wounds with the wounds of veins and other parts. I reflected upon the process of nature in the cure of wounds in general, and considered, in particular, how the union of divided parts was brought about in the operation of the harelip, and in horses necks, that are bled by farriers. Upon the whole, I was in hopes, that a suture of the wound in the artery might be successful; and, if so, it would certainly be preferable to tying up the trunk of the vessel. I communicated my thoughts to Mr. Hallowell, Mr. Keenlyside, and some other friends of the profession. A case of an aneurism from bleeding occurred, and fell to Mr. Hallowell's lot. I recommended the method I have hinted. He put it in execution June 15, 1759. Every thing was done in the usual method, till the artery was laid bare, and its wound discovered; and the tourniquet being now slackened, the gush of blood *per saltum* shewed there was no deception. Next, two ligatures, one above the orifice, and one below, were passed under the artery, that they might be ready to be tied at any-time, in case the method proposed should fail. Then a small steel pin, rather more than a quarter of an inch long, was passed through the two lips of the wound in the artery, and secured by twisting a thread round it, as in the harelip. This was found to stop the bleeding, upon which the arm was bound up, the patient put to bed, and ordered to be kept quiet, &c. The pin came away with the dressings, June 29, and July 19th, the patient was discharged from the hospital perfectly well, and with a pulse in that arm nearly as strong as in the other. Indeed, the pulse was very little altered immediately after the operation; it was weakened in a small degree, as might be expected from the diameter of the vessel being straitened; but it was so strong and equal, that we had not the least doubt of the blood's continuing to circu-

late freely through it." (*Medical Observations and Inquiries*, Vol. 2.)

We need hardly inform the reader, that the idea of healing the wound in the vessel, so as to preserve the pervious state of it, is a mere hypothesis, certainly never realized by adopting Mr. Lambert's method. If ever a small puncture of an artery heals, so as to leave the tube pervious, it is under the circumstances pointed out by Dr. Jones. (*See Hemorrhage*.) Had Lambert had an opportunity of examining the state of the vessel, sometime after the above operation, he would have found its canal obliterated; and the preservation of the perviousness of the artery being the only foundation for Lambert's method, the practice must of course fall to the ground.

AXILLARY ANEURISMS.

Aneurisms occasionally take place in the axilla, and rather than that the patient should perish of hemorrhage, it is the duty of the surgeon to tie the subclavian artery, if it be necessary, even as far inward, as where it proceeds over the first rib. A question, which here naturally presents itself is, whether the surgeon should attempt the operation in an early period of the disease, or wait till circumstances are urgent; the aneurism large and far advanced; the arm œdematous and insupportably painful; and the tumour in danger of bursting? It cannot be denied, that, in all cases of aneurism, there is a certain chance of the disease getting spontaneously well; and one axillary aneurism in a man in St. Bartholomew's Hospital a few years ago, had certainly disappeared of itself, as was proved by the account which the man gave of the case while living, and by the obliteration of the artery, found on inspection after death.

I believe, however, we ought not to suffer our conduct to be too much influenced by the hope of so unfrequent an event, and, from the observations, which I have made on this subject, I am now decidedly of opinion, that the operation should never be delayed, so as to allow the tumour to acquire an immoderate size. The operation is always difficult; but, the difficulty is seriously increased, when the swelling has extended far towards the breast, and has become so large as to push considerably upwards the clavicle. The memorable and interesting examples, in which Mr. Keate and Mr. Ramsden tied the subclavian artery, have shewn, that the anastomoses are fully competent for the supply of the limb with blood, and, I think, that delaying

the operation, with a view of allowing the inosculating arteries to enlarge, is not necessary, and, as giving time for the swelling to increase, ought to be condemned. At all events, the tumour should never be suffered to acquire an enormous size.

A wound of the axillary artery, might render it necessary to do this operation. This vessel was tied by a Mr. Hall, in Cheshire, when it had been wounded with a scythe, so as to bring the ends of the artery into view; and the arm was preserved, though it remained afterwards a little weak, which, indeed, might be owing to some large nerve being divided. (*See Scarpa*, p. 372.) Mr. White, of Manchester, relates another instance of this vessel being tied, in the case of a wound; but, mortification of the limb, and death followed. Three of the nerves were found included in the ligature. (*London Medical Journal*, Vol. 4.)

There are two modes of operating for axillary aneurisms; one by cutting below the clavicle; the other by making the wound above this bone.

The first of these methods has been attempted in France by Desault and Pelletan. The former undertook the operation in a case, where the axillary artery had been wounded. An incision, six inches long, was made below the external third of the clavicle; two thoracic arteries cut were immediately tied; the two lower thirds of the great pectoral muscle were next divided with a bistoury guided on a director; a large quantity of coagulated blood was now discharged; and the artery was directly taken hold of, and tied, together with the brachial plexus of the nerves. The arm mortified, and the patient died. This case, we must agree with Scarpa, was not a fair trial of the operation, inasmuch as the inclusion of the plexus of nerves in the ligature was an improper measure, and must have promoted the occurrence of sphacelus. It seems also probable from the account, that the vein was likewise tied; another serious and objectionable proceeding. Besides, it is worthy of notice, that the case was a wound of the axillary artery, attended with a copious effusion of blood in the cellular membrane. In all examples of this kind, gangrene is more readily induced, than when the case is a mere circumscribed aneurismal tumour. (*See Œuvres Chir. de Desault par Bichat*, Tom. 2, p. 553.) As for Pelletan's example, it hardly deserves recital, because the operation in fact was not achieved. His colleagues objected to dividing the pectoral muscle; a random thrust was made with a needle and ligature; but, the artery

was not included, and the experiment was not repeated. (See *Clinique Chirurgicale*, Tom. 2, Obs. 7, p. 49.)

In a case of axillary aneurism, which had actually burst, and the hemorrhage from which could only be stopped by pressing the artery against the first rib, Mr. Keate, the surgeon-general, practised the following operation, which was attended with completely successful consequences. This gentleman determined on taking up the artery, above the diseased and ruptured part, in its passage over the first rib. Accordingly, he made an incision obliquely downwards, divided the fibres of the pectoral muscle, that were in his way, and, when he came to the artery, passed a curved, blunt-pointed, silver needle, armed double, as he conceived, under the artery, and tied two of the ends. After a careful examination, finding that the artery pulsated below the ligature, he determined on passing another ligature higher up, and nearer to the clavicle: he, therefore, passed the needle more deeply, so as evidently to include the artery. In a few days the swelling of the arm began to subside, the wound suppurated, and the ligatures came away with the dressings. The arm afterwards recovered its feeling, and the patient regained, in a great measure, the entire motion of the shoulder, &c. (See *Med. Review and Magazine for 1801*.)

Mr. Keate's operation is objectionable, inasmuch as it was a dive made with a needle, and attended with great danger of wounding and tying parts, which should be left undisturbed.

The subclavian artery might be got at below the clavicle, as follows: the surgeon is to make an incision, through the integuments, about an inch from the sternal end of this bone. The cut is to run in the direction towards the acromion, deviating a little downward from a line parallel to that of the clavicle. This wound will bring into view some fibres of the great pectoral muscle originating from the last mentioned bone. These are next to be divided. Some cellular substance will be found underneath, which is to be carefully raised with a pair of dissecting forceps, and cut. The operator will thus arrive at the great subclavian vein, and cephalic vein uniting with it. Under the subclavian vein, and a little further backward, more under the clavicle, the subclavian artery may be felt and tied. (See *Charles Bell's Operative Surgery*, Vol. 2. p. 370.)

The axillary artery may be got at by making an incision above the clavicle, and it is undoubtedly not a very difficult plan to accomplish in the dead subject,

without any tumour under the clavicle. But it is more difficult in a living subject, having a large axillary aneurism; for, then the clavicle becomes so much elevated, and the artery lies so deeply below it, that the vessel can hardly have a ligature carried under it, without a particular needle for the purpose. This was the case in an attempt which I once saw made to tie the artery, and in which one of the cervical nerves, affected by the pulsation of the artery, was mistaken for it, and tied, so that the aneurism soon afterwards burst, and a fatal hemorrhage arose. Were a surgeon to operate above the clavicle, he should adopt the following plan:—An incision should be made just over the sternal end of the clavicle, and the clavicular portion of the sternocleidomastoideus muscle be detached with a blunt pointed curved bistoury. No further use should be made of a cutting instrument. The chief difficulty would now be, to get a ligature under the artery; but, it may be done with the aid of an ingenious needle, which Mr. Ramsden has described, and which is exactly similar in principle to one employed by Desault, called by the French, *aiguille à ressort*. As the artery communicates its pulsations to the cervical nerves in the vicinity, the operator should be particularly careful not to mistake one of them for the vessel itself.

In order to avoid the inconveniences of the needles ordinarily used for conveying ligatures under deep arteries, Desault (says Bichat) invented "une aiguille à ressort," composed of a silver tube, or sheath, which was straight at one end, and bent at the other in a semicircular form. This sheath enclosed an elastic wire, the projecting extremity of which was accurately fitted to the end of the sheath, and perforated with a transverse eye. The instrument was passed under the artery, and, as soon as it had reached the other side of the vessel, the sheath was kept fixed, while an assistant pushed the elastic wire, which, rising from the bottom of the wound, presented the aperture or eye to the surgeon, who now passed the ligature through this opening. The wire was next drawn back into its sheath again, and the whole instrument brought from beneath the artery, by which means, the ligature was conveyed under the vessel. (See *Œuvres Chirurgicales de Desault*, par Bichat, Tom. 2, p. 560.)

The invention of this needle makes a material diminution in the difficulty of taking up the subclavian artery from above the clavicle; nor, can it be wondered, that, without such an instrument,

the operation should have baffled even so skilful a surgeon as Mr. A. Cooper.

The following example is the first in which the attempt to tie the subclavian artery, by cutting above the clavicle, was ever accomplished. I conceive, that it reflects great honor on Mr. Ramsden, who undertook it, and who preferred exposing himself to a failure, rather than omit the only possible means of saving his patient from an imminent death.

John Townly, a tailor, aged thirty-two years, addicted to excessive intoxication, of an unhealthy and peculiarly anxious countenance, was admitted into St. Bartholomew's Hospital, on Tuesday, the 2d of November, 1809, on account of an aneurism in the axilla of his right arm, which had been coming on about four months. The prominent part of the tumour in the axilla was about half as big as a large orange, and there was also much enlargement and distention underneath the pectoral muscle, so that the elbow could not be brought near the side of the body.

"The temperature of both arms," says Mr. Ramsden, "was alike, and the pulse in the radial artery of each of them was correspondent. After the patient had been put to bed, some blood taken from the left arm, and his bowels emptied, his pulse, which, on his admission had been at 130, became less frequent; his countenance appeared more tranquil; and he experienced some remission of the distressing sensations in the affected arm: this relief, however, was of short duration; the weight and incumbrance of his arm soon became more and more oppressive, and, in resistance to every medical assistance, his nights were again passed without sleep, and his countenance reassumed the anxiety, which had characterized it, when he first presented himself for advice.

"On the sixth day, after his admission, his decline of health became so very evident, and the progressive elevation of the clavicle, from the increasing bulk of the tumour, was so decidedly creating additional difficulties to any future operation, that I considered it necessary to convene my colleagues, and avail myself of their opinions, as to the propriety of performing the operation; when it was agreed in consultation, that as the tumour, (although increasing) did not appear immediately to endanger the life of the patient, from any probability of its bursting suddenly, it would be adviseable yet to postpone the operation, for the purpose of allowing the greatest possible time for the anastomosing vessels to become enlarged; and, in the meanwhile, that the

case should be most vigilantly watched.

"About this period of the case, the pulsation of the radial artery of the affected arm gradually became more obscure, and soon after either ceased entirely, or, what is more probable, was lost in the succeeding œdema of the forearm and hand, both of which became loaded to a great extent.

"Notwithstanding the aneurismal tumour had continued to increase, and the patient's health had proportionately declined, yet no particular alteration was observed on the integuments, until I visited him in the evening of the twelfth day after his admission, when I found him complaining of more than usual weariness and weight in the affected limb, and painfully impatient for the impossibility, as he described it, of finding a posture for the arm.

"On examining the tumour, a dark spot appeared on its centre, surrounded by inflammation, which threatened a more extensive destruction of the skin. Under these symptoms and appearances, no farther postponement of the operation being admissible, I performed it the next day in the following manner.

"The patient being placed upon an operating table, with his head obliquely towards the light, and the affected arm supported by an assistant at an easy distance from the side, I made a transverse incision through the skin and platysma myoides along and upon the upper edge of the clavicle, of about two inches and a half in length, beginning it nearest to the shoulder, and terminating its inner extremity at about half an inch within the outward edge of the sterno-cleido-mastoideus muscle. This incision divided a small superficial artery, which was directly secured. The skin, above the clavicle, being then pinched up, between my own thumb and finger, and those of an assistant, I divided it, from within, outwards and upwards, in the line of the outward edge of the sterno-cleido-mastoideus muscle, to the extent of two inches.

"My object, in pinching up the skin for the second incision, was to expose at once the superficial veins, and by dissecting them carefully from the cellular membrane, to place them out of my way, without wounding them. This provision proved to be very useful, for it rendered the flow of blood during the operation very trifling comparatively with what might otherwise have been expected; and, thereby, enabled me with the greatest facility to bring into view those parts, which were to direct me to the artery

"My assistant having now lowered the shoulder, for the purpose of placing the first incision above the clavicle, (which I had designedly made along and upon that bone) I continued the dissection with my scalpel, until I had distinctly brought into sight the edge of the anterior scalenus muscle, immediately below the angle, which is formed by the traversing belly of the omo-hyoideus and the edge of the sterno-cleido-mastoideus, and having placed my finger on the artery, at the point where it presents itself between the scaleni, I found no difficulty in tracing it without touching any of the nerves to the lower edge of the upper rib, at which part, I detached it with my finger nail for the purpose of applying the ligature.

"Here, however, arose an embarrassment, which (although I was not unprepared for it) greatly exceeded my expectation. I had learned from repeatedly performing this operation, many years since, on the dead subject, that to pass the ligature under the subclavian artery, with the needle commonly used in aneurisms, would be impracticable; I had therefore, provided myself with instruments of various forms and curvatures to meet the difficulty, each of which most readily conveyed the ligature underneath the artery; but, would serve me no farther; for, being made of solid materials, and fixed into handles, they would not allow of their points being brought up again at the very short curvature, which the narrowness of the space, between the rib and the clavicle afforded, and which, in this particular case, was rendered of unusual depth, by the previous elevation of the shoulder by the tumour.

"After trying various means to overcome this difficulty, a probe of ductile metal was at length handed me, which I passed under the artery, and bringing up its point with a pair of small forceps, I succeeded in passing on the ligature, and then tied the subclavian artery at the part, where I had previously detached it for that purpose. The drawing of the knot was unattended with pain, the wound was closed by the dry suture, and the patient was then returned to his bed."

(See *Practical Observations on the Sclerocele &c. to which are added four cases of operations for Aneurism, by Thomas Ramsden, surgeon to Christ's Hospital, &c. p. 276, &c.*)

It only seems necessary for me to add, that immediately, the artery was tied, the pulsation of the swelling ceased; that the arm of the same side continued to be freely supplied with blood, and was even rather warmer than the opposite arm; that the operation, which was severe from

the length of time it took up, was after a time followed by considerable indisposition; that the patient died about five days after its performance; that, after the artery had been tied, the œdema of the arm, and the aneurismal tumour partly subsided; and, that, on examination after death, nothing, but the vessel, was found included in the ligature.

The case, in my opinion, does Mr. Ramsden great honor; for, the difficulty he had to encounter in conveying the ligature under the artery was such as would have baffled all men of ordinary manual dexterity. In this gentleman's publication are descriptions of instruments, which will be of great service to any future performer of this operation. The chief one is a needle, resembling that, which was invented and used by Desault, and of which I have already endeavoured to give an idea. By means of this instrument, I conceive, that the main difficulty of the operation will for the future be no longer experienced. Had Mr. Ramsden had its assistance, his patient would have been detained a very little time in the operating theatre, and the event of the case might have been completely successful. Having witnessed all the circumstances of the case, the inference, that I drew from them was, that, if the operation could have been done in a moderate time, which now seems practicable with the aid of the *aiguille à ressort*, the case in all probability would have ended well. The preceding case is particularly memorable, as being the first instance, in which the subclavian artery has been scientifically tied, without any random thrust of a needle, and without the inclusion of any part besides the artery in the ligature. It is a fact, that furnishes an encouragement to repeat the experiment, holds out the hope, that axillary aneurisms may hereafter be cured as well as inguinal ones; and confirms the competency of the anastomosing arteries to nourish the whole upper extremity, when the subclavian is tied where it emerges from behind the anterior scalenus muscle

CAROTID ANEURISMS.

The possibility of tying the carotid artery, in cases of wounds and aneurisms, without any injurious effect on the functions of the brain, now seems completely proved. Petit mentions, that the advocate Viellard, had an aneurism at the bifurcation of the right carotid, for the cure of which he was ordered a very spare diet, and directed to avoid all violent exer-

cise. Three months after this prescription, the tumour had evidently diminished; and, at last, it was converted into a small, hard, oblong, knot, without any pulsation. The patient having died of apoplexy, the right carotid was found closed up and obliterated, from its bifurcation, as low down as the right subclavian artery.—(*Acad. des Sciences de Paris, an. 1765.*) Hebenstreit, vol. 5, of his Translation of B. Bell's Surgery, mentions a case, in which the carotid artery was wounded, in extirpating a scirrhus tumour. The hemorrhage would have been fatal, had not the surgeon immediately tied the trunk of the vessel. The patient lived many years afterwards.

Dr. Baillie knew an instance, in which one carotid was entirely obstructed, and the diameter of the other considerably lessened, without any apparent ill effects on the brain. (See *Trans. of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol. 1. p. 121.*) Mr. Astley Cooper has also recorded an example, in which the left carotid was obstructed by the pressure of an aneurism of the aorta. (See *Medico-Chirurgical Transactions, Vol. 1. p. 223.*)

Mr. Abernethy was under the necessity of tying the trunk of the carotid, in the case of a large, lacerated wound of the neck, in which accident the internal carotid, and all the branches in front of the external one, were wounded. The patient seemed to be going on very well at first, but in the night he became delirious and convulsed, and died about thirty hours after the ligature was applied. Mr. A. considers the delirium and the inflammatory appearance found on the brain, on opening the body, as effects of stopping the supply of blood to the brain. I was fortunate enough to be a spectator of this interesting case, and, with due deference to Mr. Abernethy, cannot help thinking, especially when the above facts press on my mind, that the delirium might more properly be regarded as the consequence of so terrible a lacerated wound as this poor man received. Stopping the flow of blood to a part, has always been considered a chief means of averting inflammation of it, not bringing it on.

That the carotid may be tied without injuring the functions of the brain, and that aneurisms of this artery admit of being cured by the operation, is now fully proved.

On Friday, Nov. 1, 1805, Mr. Astley Cooper operated on Mary Edwards, aged 44, who had an aneurism of the right carotid artery. At this time, the tumour reached from near the chin to beyond the

angle of the jaw, and downward to within two inches and a half from the clavicle.

The swelling had a strong pulsatory motion. The woman also complained of a particular tenderness of the scalp on the same side of the head, and of such a throbbing in the brain as prevented her from sleeping.

An incision, two inches long, was made on the inner edge of the sterno-cleido-mastoideus muscle, from the lower part of the tumour to the clavicle. This wound exposed the omo-hyoideus, and sterno-hyoideus muscles, which being drawn aside towards the trachea, the jugular vein presented itself to view. The motion of this vein produced the only difficulty in the operation, as, under the different states of breathing, the vessel sometimes became tense and distended before the knife, and then suddenly collapsed. Mr. Astley Cooper introduced his finger into the wound to keep the vein out of the way of the knife, and, having exposed the carotid artery by another cut, he passed two ligatures under this vessel by means of a curved aneurism-needle. Care was taken to exclude the recurrent nerve on the one hand, and the par vagum on the other. The ligatures were then tied about half an inch asunder; but, the intervening portion of the artery was left undivided.

The pulsation of the swelling ceased immediately, the vessel was tied, and, on the day after the operation, the throbbing in the brain had subsided, while no diminution of nervous energy in any part of the body could be observed.

The patient was occasionally afflicted with bad fits of coughing; but, upon the whole went on at first pretty well. On the eighth day, however, a paralysis of the left leg and arm was noticed, attended with a great deal of constitutional irritation. Nov. 8th, the patient could move her arm rather better; but, became unable to swallow solids. Nov. 12th, the palsy of her arm had now almost disappeared. The ligatures came away. Nov. 14th, the woman was in every respect better; she swallowed with less difficulty; the tumour was smaller, and quite free from pain. On the 17th, she became very ill; the tumour increased in size, and was sore when pressed. The wound was as large as immediately after the operation, and discharged a sanious serum. Great difficulty of swallowing, and a most distressing cough, were also experienced. The pulse was ninety-six, and the left arm again very weak. On the 21st, the patient died, the difficulty of swallowing having previously become still

greater, attended with a further increase of the tumour, the skin over which had acquired a brownish red colour.

On opening the swelling after death, the aneurismal sac was found inflamed, and the clot of blood in it was surrounded with a considerable quantity of pus. The inflammation extended on the outside of the sac, along the par vagum, nearly to the basis of the skull. The glottis was almost closed, and the lining of the trachea was inflamed and covered with coagulating lymph. The pharynx was so compressed by the tumour, which had suddenly become much enlarged by the inflammation, that a bougie, of the size of a goose-quill, could hardly be introduced into the œsophagus. Mr. Astley Cooper concludes with expressing his opinion, that these causes of the fatal event might in future be avoided by operating before the tumour is of such size as to make pressure on important parts; or, if the swelling should be large, by opening it, and letting out its contents, as soon as inflammation comes on. (See *Medico-Chirurgical Transactions*, Vol. 1.)

Mr. Cline operated for a carotid aneurism, Dec. 16, 1808, in St. Thomas's Hospital. The tumour was very large, and had increased with great rapidity. The pressure of the swelling was such as to interrupt both respiration and deglutition; and to put the larynx out of its natural position. The patient had besides a frequent and troublesome cough. The pain was confined to the tumour and same side of the face.

These symptoms seemed relieved during the first twelve hours after the operation. They then became worse, particularly the cough and difficulty of breathing, and a violent irritative fever took place. The man died on the 19th of the same month. (See *London Medical Review*, No. 3.)

In the month of June 1808, Mr. Astley Cooper operated, in Guy's Hospital, on a man, aged 50, who had a carotid aneurism, attended with pain on one side of the head, throbbing in the brain, hoarseness, cough, slight difficulty of breathing, nausea, giddiness, &c. The patient got quite well, and resumed his occupation as a porter. The facial and temporal arteries of the aneurismal side of the face afterwards had no perceptible pulsation.

On the opposite side the temporal artery became unusually large. The tumour was at last quite absorbed, though a pulsation existed in it till the beginning of September. The man's intellects remained perfect; his nervous system was unaffected; and the severe pain, which, before the operation used to affect the

aneurismal side of the head, never returned.

The swelling, at the time of the operation, was about as large as a pullet's egg, and situated on the left side about the acute angle, made by the bifurcation of the common carotid, just under the angle of the jaw.

Mr. Astley Cooper began the incision opposite the middle of the thyroid cartilage, at the base of the tumour, and extended the wound to within an inch of the clavicle, on the inner side of the sterno-cleido-mastoideus muscle. On raising the margin of this muscle, the omo-hyoideus could be distinctly seen crossing the sheath of the vessels, and the nervus descendens noni was also brought into view. The sterno-cleido-mastoideus was now separated from the omo-hyoideus, when the jugular vein was seen. This vessel became so distended at every expiration as to cover the artery. When the vein was drawn to one side, the par vagum was manifest, lying between this latter vessel and the carotid artery, but a little to the outer side of the artery. The nerve was easily avoided.

A double ligature was then conveyed under the artery with a blunt iron-probe. The lower ligature was immediately tied, and the upper one was also drawn tight, as soon as about an inch of the artery had been separated from the surrounding parts above the first ligature, so as to allow the second to be tied at this height. A needle and thread were passed through the vessel below one ligature, and above the other. The artery was then divided. (See *Medico-Chirurg. Transact.* Vol. 1.)

Mr. Travers, anatomical demonstrator at Guy's Hospital, tied the carotid artery in a woman, who had an aneurism by anastomosis in the left orbit. The disease had pushed the eye out of its socket. Two small ligatures were applied, which came away on the twenty-first and twenty-second day. No hemorrhage, nor impairment of the functions of the brain took place, and the disease in the orbit was effectually cured. (See *Medico-Chirurgical Transactions*, Vol. 2, part 1. and the *London Medical Review*, No. 7.)

In order to get at the carotid artery in the safest manner, Mr. Abernethy has recommended making an incision on that side of it next the trachea, where no important parts are exposed to injury, and then to pass a finger underneath the vessel. The par vagum must be carefully excluded from the ligature; for, to tie it would be fatal.—(*Surgical Observations*, 1804.)

[Dr. Port, of New York, successfully performed the operation of tying up

the carotid artery, in January 1813. An account of this interesting case of carotid aneurism, has been published in some of the periodical works, and also in the "Elements of Surgery."]

ANEURISMAL VARIX, OR VENOUS ANEURISM.

The seat of this tumour is, in general, in the basilic vein, which is enlarged, so as to form an oblong swelling, in the middle of which is the scar, made by the lancet in bleeding. The tumour seldom extends more than two inches above and below the injury; beyond this distance the vein retains its natural size.

Dr. W. Hunter is undoubtedly the first who gave an accurate description of this disease, although Professor Scarpa is disposed to claim a share of the merit for his own countryman Guattani, who, about the same time when Dr. Hunter wrote in the *Medical Observations and Inquiries*, published the history of two cases of aneurismal varix.

"Does it ever happen in surgery," says Dr. Hunter, "that when an artery is opened through a vein, a communication, or anastomosis, is afterwards kept up between these two vessels? It is easy to conceive this case, and it is not long, since I was consulted about one, that had all the symptoms that might be expected, supposing such a thing to have actually happened, and such symptoms, as otherwise must be allowed to be very unaccountable. It arose from bleeding; and was of some years standing, when I saw it about two years ago, and I understand very little alteration has happened to it since that time. The veins, at the bending of the arm, and especially the basilic, which was the vein that had been opened, were there prodigiously enlarged, and came gradually to their natural size, at about two inches above, and as much below the elbow. When emptied by pressure, they filled again almost instantaneously, and this happened, even when a ligature was applied tight round the forearm, immediately below the affected part. Both when the ligature was made tight, and when it was removed, they shrunk, and remained of a small size, while the finger was kept tight upon the artery, at the part where the vein had been opened in bleeding. There was a general swelling in the place, and in the direction of the artery, which seemed larger, and beat stronger, than what is natural, and there was a tremulous jarring motion in the vein, which was strongest at the part, which had been punctured, and became insensible at some distance both upwards and down-

wards." (*Medical Observations and Inquiries*, Vol. 1.)

In the second volume of this work, Dr. Hunter adds some further remarks on the aneurismal varix.

"In the operation of bleeding, the lancet is plunged into the artery through both sides of the vein, and there will be three wounds made in these vessels, viz. two in the vein, and one in the artery, and these will be nearly opposite to one another, and to the wound in the skin. This is what all surgeons know has often happened in bleeding, and the injury done the artery is commonly known by the jerking impetuosity of the stream, whilst it flows from the vein, and by the difficulty of stopping it, when a sufficient quantity is drawn."

"In the next place, we must suppose that the wound of the skin, and of the adjacent, or upper side of the vein, heal up as usual; but, that the wound of the artery, and of the adjacent, or under side of the vein, remain open, (as the wound of the artery does in the spurious aneurism) and, by that means, the blood is thrown from the trunk of the artery, directly into the trunk of the vein. Extraordinary as this supposition may appear, in reality it differs from the common spurious aneurism in one circumstance only, viz. the wound remaining open in the side of the vein, as well as in the side of the artery. But this one circumstance will occasion a great deal of difference in the symptoms, in the tendency of the complaint, and in the proper method of treating it: upon which account the knowledge of such a case will be of importance in surgery."

"It will differ in its symptoms from the common spurious aneurism principally thus. The vein will be dilated, or become varicose, and it will have a pulsating jarring motion on account of the stream from the artery. It will make a hissing noise, which will be found to correspond with the pulse for the same reason. The blood of the tumour will be altogether, or almost entirely fluid, because kept in constant motion. The artery, I apprehend, will become larger in the arm, and smaller at the wrist, than it was in the natural state; which will be found out by comparing the size, and the pulse, of the artery in both arms, at these different places. The reason of which, I shall speak of hereafter. And the effects of ligatures, and of pressure upon the vessels above the elbow and below it, will be what every person may readily conceive, who understands any thing of the nature of arteries and veins in the living body."

"The natural tendency of such a complaint will be very different from that of

the spurious aneurism. The one is growing worse every hour, because of the resistance to the arterial blood, and if not remedied by surgery must at last burst. The other, in a short time, comes to a nearly permanent state; and, if not disturbed, produces no mischief, because there is no considerable resistance to the blood, that is forced out of the artery."

"The proper treatment must, therefore, be very different in these two cases, the spurious aneurism requiring chirurgical assistance, as much, perhaps, as any disease whatever; whereas, in the other case, I presume it will be best to do nothing."

"If such cases do happen, they will no doubt be found to differ among themselves, in many little circumstances, and particularly in the shape, &c. of the tumefied parts. Thus the dilatation of the veins may be in one only, or in several, and may extend lower, or higher, in one case, than in another, &c. according to the manner of branching, and to the state of the valves in different arms. And the dilatation of the veins may, also, vary, on account of the size of the artery, that is wounded, and of the size of the orifice in the artery and in the vein."

"Another difference in such cases will arise from the different manner, in which the orifice of the artery may be united or continued with the orifice of the vein. In one case, the trunk of the vein may keep close to the trunk of the artery, and the very thin stratum of cellular membrane between them, may, by means of a little inflammation and coagulation of the blood among its filaments, as it were solder the two orifices of these vessels together, so that there shall be nothing like a canal going from one to the other; and then the whole tumefaction will be more regular, and more evidently a dilatation of the veins only. In other instances the blood, that rushes from the wounded artery, meeting with some difficulty of admission and passage through the vein, may dilate the cellular membrane, between the artery and vein, into a bag, as in a common spurious aneurism, and so make a sort of canal between these two vessels. The trunk of the vein will then be removed to some distance from the trunk of the artery, and the bag will be situated chiefly upon the under side of the vein. The bag may take on an irregular form, from the cellular membrane being more loose, and yielding, at one place, than at another, and from being unequally bound down by the fascia of the biceps muscle. And if the bag be very large, especially, if it be of an irregular figure, no doubt, coagulations

of blood may be formed, as in the common spurious aneurism."

After relating two cases, very illustrative of the nature of the aneurismal varix, Dr. W. Hunter proceeds to enquire: "Why is the pulse at the wrist, so much weaker in the diseased arm, than in the other; surely, the reason is obvious and clear. If the blood can easily escape from the trunk of the artery directly into the trunk of the vein, it is natural to think, that it will be driven along the extreme branches with less force, and in less quantity."

2. "Whence is it, that the artery is enlarged all the way down the arm? I am of opinion, that it is the consequence of the blood passing so readily from the artery into the vein, and is such an extension, as happens to all arteries, in growing bodies, and to the arteries of particular parts, when the parts themselves increase in their bulk, and, at the same time, retain a vascular structure. It is well known, that the arteries of the uterus grow much larger in the time of utero-gestation. I once saw a fleshy tumour upon the top of a man's head, as large nearly as his head; and his temporal and occipital arteries, which fed the tumour, were enlarged in proportion. I have observed the same change in the arteries of enlarged spleens, testes, &c. so that I should suppose it will be found to be universally true in fact, and the reason of it in theory seems evident." (See *Medical Observations and Inquiries*, vol. 2.)

Professor Scarpa, Dr. Hunter, Mr. B. Bell, Pott, and Garneri, mention cases of the aneurismal varix, which remained stationary for fourteen, twenty, and thirty-five years. Several cases are related by Brambilla, Guattani, and Monteggia, of a cure having been obtained by means of compression. But, as this method of cure, if it does not succeed, exposes the patient to the danger of a complication of the disease with an aneurism, it ought not to be employed, except in recent cases, where the tumour is small, and in slender patients, at an early period of life, and where both of the vessels can be compressed accurately against the bone. If the disease is complicated with an aneurism, which threatens to become diffused, we are under the necessity of having recourse to an operation. (*Scarpa on Anatomy, &c. of Aneurism.*)

ANEURISM FROM ANASTOMOSIS.

This is the term which Mr. John Bell, of Edinburgh, has given to a species of aneurism, which resembles such bloody tumours, (*navi materni*) as appear in new-born children, grow to a large size, and,

ultimately bursting, emit a considerable quantity of blood.

We find clear descriptions of this disease in writers, though before the publication of Mr. John Bell's *Principles of Surgery*, it was not classed with aneurisms. Thus, Desault has recorded a case of this affection, for the express purpose of proving, that pulsation is an uncertain sign of the existence of an aneurism. (See *Parisian Chirurgical Journal*, Vol. II. p. 73.)

The aneurism from anastomosis often affects adults, increasing from an appearance like that of a mere speck, or pimple, to a formidable disease, and being composed of a mutual enlargement of the smaller arteries and veins. The disease originates from some accidental cause; is marked by a perpetual throbbing; grows slowly, but uncontrollably; and is rather irritated, than checked, by compression. The throbbing is at first indistinct, but when the tumour is perfectly formed, the pulsation is very manifest. Every exertion makes the throbbing more evident. The occasional turgid states of the tumor produce sacs of blood in the cellular substance, or dilated veins, and these sacs form little, tender, livid, very thin, points, which burst, from time to time, and then, like other aneurisms, this one bleeds so profusely, as to induce extreme weakness.

The tumour is a congeries of active vessels, and the cellular substance, through which these vessels are expanded, resembles, as Mr. John Bell describes, the gills of a turkey cock, or the substance of the placenta, spleen, or womb. The irritated and incessant action of the arteries fills the cells with blood, and from these cells, it is reabsorbed by the veins. The size of the swelling is increased by exercise, drinking, emotions of the mind, and by all causes which accelerate the circulation.

The hemorrhage from the aneurism by anastomosis sometimes usurps, in the female subject, the place of menstruation, as the following example illustrates.

Ann Vaehot, of St. Maury, in Bresse, was born with a tumour on her chin, of the size and shape of a small strawberry, without pain, heat, or discolouration of the skin. As it produced no uneasiness, nor inconvenience whatever, it excited little attention, particularly as it did not seem to increase with the growth of the child. For the first fifteen years, there was but little alteration; but, about the menstrual period, it increased suddenly to double the size, and became more elongated in its form. A quantity of red blood was observed to ooze from its extremity. This flux became, in some measure, periodical, and sometimes was sufficiently abundant to produce an alarming

degree of weakness. Each period of its return was preceded by a violent pain in the head and numbness.

Before and after the appearance of these symptoms, there was no alteration in the size of the tumour; the only difference was a small enlargement of the cutaneous veins, with an increase of heat in the part, occasioning some degree of tenderness.

The menses at length took place, but, in small quantity, and, at irregular periods, without influencing the blood discharged from the tumour, or the frequency of the evacuation.

The breasts were not enlarged till a late period, nor did the approach of puberty seem to have its accustomed influence on those glands, &c. (See *Parisian Chirurgical Journal*, Vol. II. p. 73, 74.)

"This aneurism, (observes Mr. John Bell,) is a mere congeries of active vessels, which will not be cured by opening it; all attempts to obliterate the disease with caustics, after a simple incision, have proved unsuccessful, nor does the interrupting of particular vessels, which lead to it, affect the tumour; the whole group of vessels must be extirpated. In varicose veins, or in extravasations of blood, such as that produced under the scalp from blows upon the temporal artery, or in those aneurisms, produced in schoolboys by pulling the hair, and, also, in those bloody effusions from blows on the head, which have a distinct pulsation, the process of cutting up the varix, aneurism, or extravasation, enables you to obliterate the vessel and perform an easy cure. But, in this enlargement of innumerable small vessels, in this aneurism by anastomosis, the rule is 'not to cut into, but to cut it out.' These purple and ill-looking tumours, because they are large, beating, painful, covered with scabs, and bleeding, like a cancer in the last stage of ulceration, have been but too often pronounced cancers! incurable bleeding cancers! and the remarks, which I have made, while they tend, in some measure, to explain the nature and consequences of the disease, will remind you of various unhappy cases, where either partial incisions only had been practised, or the patient left entirely to his fate." (See *John Bell's Principles of Surgery*, Vol. I.)

In the section on carotid aneurisms, I have mentioned the case, in which Mr. Travers cured an aneurism by anastomosis in the orbit, by tying the common carotid artery.

For information on aneurism, consult *Lauth's Scriptores Latini de Aneurismatibus*, which work contains *Asman's Dissertatio Medica Inauguralis de Aneurismate*; *Guattani, de Externis Aneurismatibus*; *Lan-*

cist de Aneurysmatibus. Opus Posthumum; Mutani de Aneurysmaticis Præcordiorum Morbis Animadversiones; Verbrugge, Dissertatio Anatomico Chirurgica de Aneurismate; Wetinus Dissertatio Inauguralis Medica de Aneurysmate Vero Pectoris Externo Hemiplegiæ Sobole; Murray, Observations in Aneurismata Femoris; Trew, Aneurysmatis Spurii Post Venæ Basilicæ Sectionem Orti, Historia et Curatio. See also an account of Mr. Hunter's Method of performing the Operation for the Cure of the Popliteal Aneurism, by E. Home, in the Trans. of a Society for the Improvement of Med. and Chirurg. Knowledge, Vol. I. p. 138, and Vol. II. p. 235. Sabatier's Médecine Opératoire, Tom. 3. Medico-Chirurg. Transactions, Vol. I. and II. Cases in Surgery by J. Warner, p. 141, &c. Edit. 4. Richerand's Nosographie Chirurgicale, Tom. 4. Pelletan's Clinique Chirurgicale, Tom. 1 and 2. A Burn's Surgical Anatomy of the Head and Neck. Ramsden's Practical Observations on the Sclerocoele, with four cases of operations for aneurism. Œuvres Chirurgicales de Desault par Bichat, Tom. 2, p. 553. Wells in Transact. of a Society for the Improvement of Med. and Chirurg. Knowledge, Vol. 3, p. 81—85, &c. Corvisart, Essai sur les Maladies et les Lésions Organiques du Cœur et des Gros Vaisseaux. Edit. 2. C. Bell's Operative Surgery, Vol. I. John Bell's Principles of Surgery, Vol. I. Richter's Anfangsgründe der Wundarzneikunst, Band 1. Abernethy's Surgical Works. Monro's Observ. in the Edinb. Med. Essays. Various productions in the Med. Observ. and Inquiries. The article Aneurism in Rees's Cyclopædia. Freer's Observations on Aneurism, 1807; and a Treatise on the Anatomy, Pathology, and Surgical Treatment of Aneurism by A. Scarpa, translated by J. H. Wishart, 1808. The original Italian was published 1804.

ANODYNES, (from α neg. and $\omega\delta\nu\eta$, pain.) Medicines are so termed, which diminish, or remove, pain, and they are indicated in surgery in all cases, in which it is desirable to relieve any intense pain. Opium is the principal one deserving confidence.

ANTHRACOSIS, (from $\alpha\nu\theta\rho\alpha\zeta$, a burning coal.) A red, livid, burning, sloughy, very painful tumour, occurring on the eyelids. At first, antiphlogistic means, are proper; but the grand thing is to make a free and early opening for the discharge of the matter contained in the swelling. The eye-lids and eye should be bathed with a collyrium, and kept cool with the saturnine lotion.

ANTHRAX, ($\alpha\nu\theta\rho\alpha\zeta$, a burning coal.) See Carbuncle.

ANTIMONIUM CALCINATUM,—or **PULVIS ANTIMONIALIS**. (Supposed to be

very similar to James's Powder.) Is now called the antimonial powder. In all cases of surgery, in which it is desirable to promote the secretions in general, and those of urine, perspiration, and of the alimentary canal, in particular, it is proper to have recourse to this important preparation. In all inflammations of the brain and its membrane, and, in every instance, in which there exists an inflammation of a viscus of high importance in the system, antimony should be exhibited, and, in general, the antimonial powder is as eligible a prescription as any. For an adult, four or five grains may be ordered, and the dose, if requisite, may be repeated, two or three times a day.

ANTIMONIUM MURIATUM. This has often been named, *butter of antimony*, and is employed in surgery as a caustic.

ANTIMONIUM TARTARIZATUM, (*Emetic Tartar.*) This medicine is well known as the most common emetic. For this purpose, it may be given in either of the following ways, as the indications of the case may demand. \mathfrak{z} . Antimonii Tart. gr. ij. Aq. distil. \mathfrak{z} iv. Misce et cola. Dosis \mathfrak{z} ij. pro emetico; vel \mathfrak{z} ss quadrante quoque horæ, donec supervenerit vomitus.

If tartarised antimony be exhibited merely to excite a diaphoresis, half an ounce, or one table spoonful, of the above mixture is to be given once every six hours.

This preparation is very much employed by the best continental surgeons, for increasing the gastric secretions, and maintaining, for a length of time, a lax state of the bowels. We shall have occasion to notice its efficacy in the cure of numerous surgical diseases, particularly *Anaurosis*, *Erysipelas*, *Injuries of the Head*, &c.

ANTIPHLOGISTICS, (from $\alpha\nu\tau\iota$, against, and $\phi\lambda\epsilon\gamma\omega$, to burn.) All means are so termed, which have a tendency to subdue inflammation. (See *Inflammation*.)

The first of these, to which the surgeon should direct his attention, when he wishes to cure an inflammatory affection, is to remove as far as it is in his power, the occasional cause. Extraneous bodies, lodged in parts, susceptible of this kind of irritation, and which substances produce inflammation by their mechanical operation, should be extracted as soon as possible, if their particular situation, shape, &c. will admit of it. The removal of substances, which irritate by their chemical properties, is difficult, and sometimes impracticable.

On account of their great activity, however, it is necessary to oppose their effects, without loss of time. This is accomplished, in a certain degree, by diluting such substances with aqueous fluids, defending the parts from their action by oily and sedative

applications; and, by correcting the specific irritation of the substances applied, by means of other substances, which have a particular affinity with them.

Antiphlogistic remedies, properly so called, are divided into *general* ones, by which are meant such as affect the whole system; and into *topical* ones, the operation of which is, at least, for a certain time, entirely local and circumscribed.

General antiphlogistics are: 1. Bleeding. (See this word.)

2. Glysters, and gentle laxative medicines. The most active cathartics may sometimes be considered in the same light; but, there are many inflammations, in which the effect of strong purgatives is hurtful and dangerous. Such are, in particular, all instances, in which there is inflammation of the thoracic, and abdominal viscera.

3. Aqueous diluting beverages, taken in large quantities.

4. The warm bath.

5. Cooling medicines, such as acid drinks, saline draughts, and some of the neutral salts, such as nitre, the ammonia muriata, aq. ammon. acet. &c.

6. Anodynes, especially opium, only to be given, however, under the circumstances, and in the way, to be noticed in the article, *Inflammation*.

With these direct means of diminishing the action of the sanguiferous system, we must combine a more or less complete abstinence from all solid animal food. Too warm an atmosphere should also be avoided, as well as all stimulants whatever, every kind of noise, every thing likely to alarm, or disturb the mind, &c.

Topical antiphlogistics are: 1. Local bleeding practised by means of leeches, scarifications, or cupping.

2. Emollient poultices, which are proper, when the inflammation is accompanied with an extraordinary degree of pain and hardness, and, especially, when it is disposed to suppurate. The best emollient poultice is that of linseed, described in the article *Inflammation*. Some use the one made of bread and milk; some disliking milk, in consequence of its inutilty, and its tendency to turn sour, only use water: while others make the bread into a poultice by softening it, and beating it up, with Goulard's lotion.

3. Discutients are particularly used in all cases, in which the inflammation is less acute, and seems to have no tendency to suppurate. Cold water, various preparations containing lead, a solution of sal ammoniac in vinegar and water, spirit of wine, vinegar, æther, the various infusions of bitter aromatic plants, and the decoction of bark, are very good discutient remedies.

4. The maintenance of a continual evaporation from the surface of the inflamed part, by applying folded linen, wet with the lotio aq. litharg. acet. cold water, a solution of zincum vitriolatum, &c. Spirits, æther, snow, or powdered ice, produce more cold, and, are sometimes, though not very commonly, made use of. This is the ordinary principle, on which surgeons conduct the local treatment of phlegmonous inflammation, when there is the prospect of avoiding the formation of an abscess.

5. Fomentations. These are prepared by dipping flannels in some warm liquor, squeezing a certain quantity of fluid out of them, and then placing them quite warm on the inflamed part. They are mostly used in cases, in which emollient poultices are the permanent local applications, and when the patient suffers extraordinary pain. A decoction of white poppy heads, or camomile flowers, is the liquor commonly employed. Fomentations are very temporary means, being only applied in general, about half an hour, two, or three times a day. The best opportunity of doing this, is when the poultice is to be changed.

6. Among the means, essential to an antiphlogistic regimen, perfect quietude, both of body and mind, is not the least important. (See *Inflammation*.) *Encyclopédie Méthodique; Partie Chirurgicale*.

ANTISEPTICS, (from *αντι*, against, and *σηπω*, to purify.) This name is given to such remedies, as are supposed to have the virtue of resisting the tendency to putrefaction in the human body, or to arrest its progress, after it has commenced. According to these ideas, they are indicated in cases of mortification, and sloughing ulcers.

The greatest part of antiphlogistic remedies are also antiseptic, as we shall see the reason of in the article *Mortification*. The most renowned antiseptic remedies of the internal kind, are vegetable, and mineral acids, fluids impregnated with carbonic acid gas, wine, aromatics, camphor, bitters in general, and, particularly, bark. The chief external antiseptic applications are preparations of lead, cold water, snow, ice, spirits, turpentine, or aromatics, such as camomile flowers, rue, &c. It has also been recommended to apply the carbonic acid gas itself. This may be done, either by directing the air against the parts affected through a funnel, as soon as the gas is extricated from the substances, which contain it; or by applying to the parts affected poultices, composed of such ingredients, as will ferment, and form a large quantity of the gas. (See *l'Encyclopédie Méthodique; Partie Chirurgicale*.)

ANTRUM MAXILLARE. This is a considerable cavity, situated in the upper jaw bone. It is also named the *Sinus Maxillaris*, or *Antrum Highmorianum*, from the name of an anatomist, who gave the first accurate description of it.

The antra are liable to several morbid affections. Sometimes, their membranous lining inflames, and secretes pus. At other times, in consequence of inflammation, or other causes, various excrescences and fungi are produced in them. Their bony parietes are occasionally affected with exostosis, or caries. Extraneous bodies may be lodged in them, and, it is even asserted, that insects may be generated in them, and cause, for many years, very afflicting pains.

ABSCESSES IN THE ANTRUM.

Of all the above cases, this is far the most common. Violent blows on the cheeks, inflammatory affections of the adjacent parts, and, especially, of the pituitary membrane lining the nostrils, exposure to cold and damp, and, above all things, bad teeth, may induce inflammation and suppuration in the antrum. The first symptom is a pain, at first imagined to be a tooth-ach, particularly if there should be a carious tooth, at this part of the jaw. This pain, however, extends more into the nose, than that usually does, which arises from a decayed tooth; it also affects, more or less, the eye, the orbit, and the situation of the frontal sinuses. But, even such symptoms are insufficient to characterize the disease, the nature of which is not unequivocally evinced, till a much later period. The complaint is, in general, of much longer duration, than one entirely dependent on a caries of a tooth, and its violence increases more and more, until, at last, a hard tumour becomes perceptible below the cheek bone. The swelling, by degrees, extends over the whole cheek: but, it afterwards rises to a point, and forms a very circumscribed hardness, which may be felt above the back grinders. This symptom is accompanied by redness, and sometimes by inflammation and suppuration of the external parts. It is not uncommon, also, for the outward abscess to communicate with that within the antrum.

The circumscribed elevation of the tumour, however, does not occur in all cases. There are instances in which the matter makes its way towards the palate, causing the bones of this part to swell, and, at length, rendering them carious, unless timely assistance be given. There are other cases, in which the matter escapes between the fangs and sockets of the teeth. Lastly, there are other examples, in which

matter, formed in the antrum, makes its exit at the nostril of the same side, when the patient is lying with his head on the opposite one, in a low position. If this mode of evacuation should be frequently repeated, it prevents the tumour, both from pointing externally, and bursting, as it would do if the purulent matter could find no other vent. But this evacuation of pus from the nostril is not very common; for, according to Mr. Hunter, the opening between the antrum and cavity of the nose, is generally stopped up. This celebrated anatomist even seems inclined to think, that the disease may sometimes be occasioned by the impervious state of this opening, in consequence of which obstruction, the natural mucus of the antrum may collect there in such quantity, as to irritate and inflame the membrane, with which it is in contact. This may happen in the same way as an obstruction in the ductus nasalis hinders the passage of the tears into the nose, and causes an abscess in the lachrymal sac. (See *Natural Hist. of the Human Teeth*, &c. by John Hunter, p. 174.) However, in the majority of cases, we may conclude, that the impervious state of the opening is rather an effect, than the cause, of the disease, since inflammation in the antrum is often manifestly produced by causes of a different kind, and since the opening in question is not invariably closed.

Abscesses in the antrum require a free exit for their contents, and, if the surgeon neglects to procure such opening, the bones become more and more distended and pushed out, and, finally, carious. When this happens, the pus makes its appearance, either towards the orbit, the alveoli, the palate, or, as is mostly the case, towards the cheek. The matter having thus made a way for its escape, the disease now becomes fistulous.

In all cases the principal indication is to discharge the matter, whether the pus is simply confined in the antrum, or whether the case be conjoined with a carious affection of the bones.

The ancients seem to have known very little of the treatment of diseases of the antrum. Drake, an English anatomist, is reputed to be the first proposer of a plan for curing abscesses of this cavity. Meibomius, however, had, a long while before him, proposed, with the same intention, to extract one or more of the teeth, in order that the matter might find an opening for its escape, through the sockets. This plan may be employed with success. The pus frequently has a tendency to make its way outward towards the teeth; it often affects their fangs; and, after their extraction, the whole of the abscess is seen

to escape through the sockets. But this very simple plan will not suffice for all cases, as there are numerous instances, in which there is no communication between the alveoli and the antrum.

Drake, and, perhaps, before him, Cowper, took notice of the insufficiency of Meibomius's method, and, hence, they proposed making a perforation through the socket into the antrum with an awl, for the purpose of letting out the matter, and injecting into the cavity such fluids as were judged proper.

The extraction of one or more teeth, and the perforation of the alveoli, being essential steps in treating diseases of the antrum, we must consider what tooth ought to be taken out in preference to others.

A caries, or even a mere continual aching, of any particular tooth, in general ought to decide the choice. But, if all the teeth should be sound, which is not often the case, writers direct us to tap each of them gently, and to extract the one, which gives most pain on this being done. When no information can be thus obtained, other circumstances ought to guide us.

All the grinding teeth, except the first, correspond with the antrum. They even sometimes extend into this cavity, and the fangs are only covered by the pituitary membrane. The bony lamella, which separates the antrum from the alveoli, is attenuated, towards the back part of the upper jaw. Hence, it is best, when the choice is in our power, to extract the third or fourth grinder, as, in this situation, the alveoli can be more easily perforated. Though, in general, the first grinder and canine tooth do not communicate with the antrum, yet, their fangs occasionally approach the side of this cavity.

When one or more teeth are carious, they should be removed, because they are both useless and hurtful. The matter frequently makes its escape, as soon as a tooth is extracted, in consequence of the fang having extended into the antrum, or rather in consequence of its bringing away with it a piece of the thin partition between it and the sinus. Perhaps a discharge may follow from the partition itself being carious. If the opening thus produced, be sufficiently large to allow the matter to escape, the operation is already completed. But, as it can easily be enlarged, it ought always to be so when there is the least suspicion of its being too small. However, when no pus makes its appearance, after a tooth is extracted, the antrum must be opened by introducing a pointed instrument in the direction of the alveoli. Some

use a small trocar, or awl; others a gimblet for this purpose.

The patient should sit on the ground, in a strong light, resting his head on the surgeon's knee, who is to sit behind him. Immediately the instrument has reached the cavity, it is to be withdrawn. Its entrance into the antrum is easily known by the cessation of resistance. After the matter is discharged, surgeons advise the opening to be stopped up with a wooden stopper, to keep victuals from getting into the antrum.

The stopper is to be taken out, several times a day, to allow the pus to escape. This plan soon disposes the parts affected to discontinue the suppuration, and resume their natural state. Sometimes, however, the pus continues to be discharged, for a long time after the operation, without any change occurring, in regard to its quality or quantity. In such instances the cure may often be accelerated by employing injections of brandy and water, lime-water, or a solution of zincum vitriolatum.

Some surgeons prefer a silver cannula instead of the stopper, as it can always be left pervious except at meals.

If no opening were made in the antrum, the matter would make its way, sometimes towards the front of this cavity, which is very thin; sometimes, towards the mouth, and fistulous openings, and caries would inevitably follow.

When the bones are carious, the above plan will not accomplish a cure, until the affected pieces of bone exfoliate. A probe will generally enable us to detect any caries in the antrum. The fetid smell, and ichorous appearance of the discharge, also, leave little doubt that the bones are diseased; and, in proportion as the bones free themselves of any dead portions, the discharge has less smell, and its consistency becomes thicker.

There are cases, in which there are loose pieces of dead bone to be extracted, and, in which it is requisite to make a larger opening into the antrum, than can be obtained, at its lower part. Instances also occur, in which patients have lost all the grinding teeth, and the sockets are quite obliterated, so that a perforation from below could hardly be effected. Some practitioners have also objected to ever sacrificing a sound tooth. In these circumstances, it has been advised to make a perforation in the antrum, above the alveolar processes. M. Lamoricièr is the first who proposed this method. It consists in making a transverse incision, below the malar process, and above the root of the third grinder. Thus the gum and periosteum are divided, and the bone ex-

posed. A perforating instrument is to be conveyed into the middle of this incision, and the opening in the antrum made as large as requisite. There are cases of very extensive exfoliations of the antrum, in which it is absolutely necessary to expose a great part of the surface of the bone, and to cut away the dead pieces which are wedged, as it were, in the living ones. A small trephine may sometimes be advantageously applied to the malar process of the superior maxillary bone.

Surgeons formerly treated carious affections of the antrum in the most absurd and unscientific way, introducing setons through its cavity, and even having recourse to the actual cautery. The moderns, however, are not much inclined to adopt this sort of practice. It is now known, that the detachment of a dead portion of bone, in other terms, the process of exfoliation, is nearly, if not entirely, the work of nature, in which the surgeon can at most only act a very inferior part. Indeed, he should limit his interference to preventing the lodgment of matter, maintaining strict cleanliness, and removing the dead pieces of bone, as soon as they become loose. But, it is to be understood, that there are occasional examples, in which the dead portions of bone are so tedious of separation, and so wedged in the substance of the surrounding living bone, that an attempt may be properly made to cut them away.

TUMOURS OF THE ANTRUM.

Ruysch, Bordenave, Desault, Abernethy, and many others, have recorded cases of polypous, fungous, and cancerous diseases of the antrum, and of the parietes of this cavity being affected with exostosis.

The indolence of any ordinary fleshy tumour in the antrum, while in an incipient state, certainly tends to conceal its existence; but, such a disease rarely occurs without being accompanied by some affection of the neighbouring parts, and, hence its presence may generally be ascertained before it has attained such a size as to have altered the conformation of the antrum. This information may be acquired by examining, whether any of the teeth have become loose, or have spontaneously fallen out; whether the alveolar processes are sound, and whether there are any fungous excrescences making their appearance at the sockets; whether there is any habitual bleeding from one side of the nose; any sarcomatous tumour at the side of the nostril, or towards the great angle of the eye. When the swelling has

attained a certain size, the bony parietes of the antrum are always protruded outwards, unless the body of the tumour should be situated in the nostril, and only its root in the antrum. This case, however, is very uncommon.

As soon as a tumour is certainly known to exist in the antrum, the front part of this cavity should be opened, without waiting till the disease makes further progress. In a few instances, indeed, we may avail ourselves of the opening, which is sometimes found in the alveolar process, and enlarge it sufficiently to allow the tumour to be extirpated. If the front of the antrum were freely opened, it would in general be better to cut away the disease in its interior.

A swelling of the parietes of the antrum, in consequence of an abscess, or a sarcomatous tumour in its cavity, may lead us to suppose the case an enlargement of the bones, or an exostosis. The symptoms of the two first affections have been already detailed. A sign of an exostosis is, when besides the absence of the symptoms characterizing an abscess or a sarcoma, the thickened parietes of the antrum form a solid resistance; whereas, in cases of mere expansion, the dimensions of the surface of the bone being increased, while its substance is proportionally attenuated, the resistance is not so considerable.

When such an exostosis depends upon a particular constitutional cause, and, especially, upon one of a venereal nature, it must be attacked by remedies suited to this affection. But, when the disease resists internal remedies, and its magnitude is likely to produce an aggravation of the case, a portion of the bone may be removed with a trephine, or a cutting instrument. Such operations, however, require a great deal of delicacy and prudence.

Mr. B. Beil, vol. 4, describes a kind of exostosis of the upper jaw, very different from what we have mentioned, since instead of its being distinguishable from other diseases of the antrum by the greater firmness of the tumour, the substance of the bone gradually acquires such suppleness and elasticity, that it yields to the pressure of the fingers, and immediately resumes its former plumpness, when the pressure is discontinued. If the bone be cut, it is found to be as soft as cartilage, and, in an advanced stage of the disease, its consistence is almost gelatinous. The swelling increases gradually, and extends equally over the whole cheek, without becoming prominent at any particular point, or only so in the latter periods of the malady, when the soft parts inflame and be-

come affected. The complaint is described as totally incurable. Cutting and trephining the tumour, as recommended in other cases of exostosis, only exasperate the patient's unhappy condition.

Mr. Abernethy has related an account of a very singular disease of the antrum. The patient, who was 34 years of age when the account was written, perceived, when about ten years old, a small tumour on his left cheek, which gradually attained the size of a walnut, and then remained, for some time, stationary. About a year afterwards, the tumour having again enlarged, a caustic was applied to the integuments, so as to expose the bone. The actual cautery was next applied, and an opening thus made into the antrum. After the exfoliation the antrum became filled with a fungus, which rose out upon the cheek, and could not be restrained by any applications. Part of the fungus also made its way into the mouth, through the socket of the second tricuspid tooth, the other teeth remaining natural. The disease continued in this state nine years, occasionally bleeding in an alarming way. When the patient was in his 20th year, the whole fungus sloughed away during a fever, and has not returned. After this the sides of the aperture in the bone began to grow outwards, forming an exostosis, which has grown to a great magnitude. A small exostosis took place in the mouth, but became no larger than a horse bean. The exostosis of the maxillary bone is of an irregular figure, and projects from the whole circumference of the aperture a great way directly forward. Mr. Abernethy compares its appearance, when he was writing, with that of a large tea-cup fastened upon the face, the bottom of which may be supposed to communicate with the antrum. The diameter of the cup, formed by the circular edge of the bone was three inches and a half; the depth two inches and seven-eighths. The general height of the sides of the exostosis, from the basis of the face was two inches; its walls were not thick, and terminated in a thin circular edge. The integuments, as they approach this edge, become attenuated, and they extend over the edge into the cavity. The exostosis now reaches to the nose in front, and to the masseter muscle behind; above it includes the very ridge of the orbit, and below it grows from the edge of the alveolar process. A line that would have separated the diseased from the sound bone, would have included the orbit and nose, and indeed, one half of the face. Mr. Abernethy saw no means of affording the man relief. (*Transactions of a Society for the Improvement of Med. and Chirurgical Knowledge, Vol. 2.*)

In a case of fungus growing in the antrum, and which had distended the antrum, hindered the tears from passing down into the nose, raised the lower part of the orbit, caused a protrusion of the eye, made two of the grinding teeth fall out, and occasioned a carious opening in the front of the antrum, through which opening a piece of the fungus projected, Desault operated as follows: the cheek was first detached from the os maxillare, by dividing the internal membrane of the mouth, at the place where it is reflected over this bone. Thus, the outer surface of the bone was denuded of all the soft parts. A sharp, perforating instrument was applied to the middle of this surface, and an opening made more forward than the one already existing. The plate of bone, situated between the two apertures, was removed with a little falciform knife, which, being directed from behind forward, made the division without difficulty. The opening, thus obtained, being insufficient, Desault endeavoured to enlarge it below, by sacrificing the alveolar process. This he endeavoured to accomplish with the same instrument, but, finding the resistance too great, he had recourse to a gouge and mallet. A considerable piece of the alveolar arch was thus detached, without any previous extraction of the corresponding teeth, three of which were removed by the same stroke. In this manner an opening was procured in the external and inferior part of the antrum, large enough to admit a walnut. Through this aperture a considerable part of the tumour was cut away with a knife, curved sideways, and fixed in its handle. A most profuse hemorrhage took place; but, Desault, unalarmed, held a compress in the antrum for a short time; this being removed, the actual cautery was applied repeatedly to the rest of the fungus. The cavity was dressed with lint, dipped in powdered colophony.

On the eighteenth day the swelling was evidently diminished, the eye less prominent, and the epiphora less visible. But, at this period a portion of fungus made its appearance again. This was almost entirely destroyed by applying the actual cautery twice. It appeared again, however, on the 25th day, and required a third and last recourse to the cautery. From this time the progress of the cure went on rapidly. Instead of fungous excrescences, healthy granulations were now formed in the bottom of the sinus. The parietes of the antrum, gradually approaching each other, the large opening made in the operation was obliterated, and reduced to a small aperture, hardly large enough to admit a probe. Even this little opening

was closed in the fourth month, at which time no vestiges of the disease remained, except the loss of teeth, and a very obvious depression just where they were situated.]

In all fungous diseases of the antrum, making a free exposure of them is an essential part of the treatment: if you neglect this method, how can you inform yourself of the size, form, and extent, of the tumour? How could you remove the whole of the fungus, through a small opening, which would only allow you to see a very little portion of the excrescence? How could you be certain that the disease were extirpated, to its very root? Even when the antrum is freely opened, this circumstance can only be learnt with difficulty; and how could it be ascertained, when only a point of the cavity is opened? A portion, left behind, very soon gives origin to a fresh fungus, the progress of which is more rapid, and the character more fatal, in consequence of being irritated by the surgical measures adopted. (*Euvres Chirurgicales de Desault par Bichat, Tom. 2.*)

I imagine that English surgeons, unaccustomed to use the actual cautery, will peruse with a degree of aversion, this means so commonly employed in France by Desault, and other celebrated surgeons. Nor can I expect that they will altogether approve the use of the mallet and gouge, for making a free opening into the antrum. Perhaps, it might be better to trephine this cavity with a small instrument for the purpose, and then cut the fungus away. After removing as much of it as possible in this manner, some instrument of suitable shape might be used to scrape the part, where the tumour has its root. However, if there be any ease in which potent and violent measures, like those of Desault, are allowable, it is the one, of which we have just been treating. Inveterate diseases demand powerful means, and tampering with them is generally more hurtful than useful.

[To this preference of the trephine over any other method of exposing the cavity, the American editor begs leave to give his decided approbation: having performed that operation, he can testify its facility and safety.]

There is an interesting case of a fungus in the maxillary sinus, related in the first volume of the Parisian Chirurgical Journal. It was at last cured by opening the antrum, applying the cautery, and tying the portion of the tumour, which had made its way into the nose. In the second volume of the same work, is an excellent case, exhibiting the dreadful ra-

vages, which the disease may produce when left to itself.

INSECTS IN THE ANTRUM.

It is said, that insects in this cavity may sometimes make it necessary to open the part. This case, however, must be exceedingly rare, and even what we find in authors (*Pallas de insectis viventibus intra viventia*), appears so little authentic, that we should hardly have thought it necessary to make mention of the circumstance, if there were not, in a modern work (*Med. Comm. Vol. 1.*) a fact which appears entitled to implicit belief. Mr. Heysham, a medical practitioner at Carlisle, relates, that a strong woman, aged sixty, in the habit of taking a great deal of snuff, was subject, for several years, to acute pains in the antrum, extending over one side of the head. These pains never entirely ceased, but were more severe in winter than summer, and were always subject to frequent periodical exasperations. The patient had taken several anodyne medicines, and others, without benefit, and had twice undergone a course of mercury, by which her complaints had been increased. All her teeth on the affected side had been drawn. At length it was determined to open the antrum with a large trocar, though there were no symptoms of an abscess, nor of any other disease in this cavity. For four days no benefit resulted from this operation. During this space, bark injections, and the elixir of aloes, were introduced into the sinus. On the fifth day a dead insect was extracted, by means of a pair of forceps, from the mouth of the cavity. It was more than an inch long, and thicker than a common quill. The patient now experienced relief for several hours: but, the pains afterwards recurred with as much severity as before: oil was next injected into the antrum, and two other insects, similar to the former, were extracted. No others appeared, and the wound closed. The pains were not completely removed, but they were considerably diminished for several months, at the end of which time they became worse than ever, particularly affecting the situation of the frontal sinus.

M. Bordenave has published, in the twelfth and thirteenth volumes of the *Mem. de l'Acad. de Chir.* Edit. 12mo. two excellent papers on the diseases of the antrum. In the thirteenth volume, he relates the history of a case, in which several small whitish worms, together with a piece of fetid fungus, were discharged from the antrum, after an opening had been made on account of an abscess of the antrum, attended with caries. (*P. 381.*)

But, in this instance, the worms had probably been generated after the opening had been made in the cavity; for, when they made their appearance, the opening had existed nine months.—(See on this subject *Precis d'Observations sur les Maladies du Sinus Maxillaire* Par M. Bordenave, in *Mem. de l'Acad. Royale de Chirurgie*, Tom. 12, Edit. in 12mo. Also *Suite d'Observations sur le même Subject*, by M. Bordenave, Tom. 13, of the said Work. *L'Encyclopédie Méthodique, Partie Chirurgicale, art. Antre Maxillaire. Remarques et Observations sur les Maladies du Sinus Maxillaire*, in *Œuvres Chirurgicales de Desault* par Bichat, Tom. 2, p. 156. *Desault's Parisian Surgical Journal*, Vol. 1 and 2. *Medical Communications*, Vol. 1. *Trans. of a Society for the Improvement of Med. and Surgical Knowledge*, Vol. 2. *Natural History of the Human Teeth*, by John Hunter, p. 174, 175, Edit. 3. *Gooch's Surgical Works*, Vol. 2, p. 61, and Vol. 3, p. 161, Edit. 1792.)

ANUS. The lower termination of the great intestine, named the rectum, is so called, and its office is to form an outlet for the feces.

The anus is furnished with muscles, which are peculiar to it, viz. the sphincter, which keeps it habitually closed, and the *levatoris ani*, which serve to draw it up into its natural situation, after the expulsion of the feces. It is also surrounded, as well as the whole of the neighbouring intestine, with muscular fibres, and a very loose sort of cellular substance.

The anus is subject to various diseases, in which the aid of surgery is requisite: of these we shall next treat.

IMPERFORATE ANUS.

This complaint is sometimes met with, though not very often. As it is of the utmost consequence that such malformations should not remain long unknown, one of the earliest duties of an accoucheur, after delivery, should be the examination of all the natural outlets of the new-born infant.

Such an inspection sometimes evinces, that the place in which the extremity of the rectum, or the anus, ought to be, is entirely, or partly shut up by a membrane, or fleshy adhesion. In other instances, no vestige of the intestine can be found, as the skin retains its natural colour over the whole space, between the parts of generation and the os coccygis, without being more elevated in one place than another. In such cases the intestine sometimes terminates in one or two cul-de-sac, about an inch upward from the ordinary situation of the anus. Sometimes it does not descend lower than the

upper part of the sacrum; sometimes it opens into the bladder, or vagina.

When a surgeon is consulted for such cases, he must not lose much time in deliberation; for, if a speedy opening be not made for the feces, the infant will certainly very soon perish, with symptoms similar to those of a strangulated hernia. After ascertaining the complaint, which is an easy matter, we should endeavour to learn, whether the anus is merely shut by a membrane, or fleshy adhesion: or whether the anus is altogether wanting, in consequence of the lower portion of the cavity of the gut being obliterated, or the rectum not extending sufficiently far down.

When a membrane, or a production of the skin closes the opening of the rectum, the part producing the obstruction, is somewhat different in colour from the neighbouring integuments. It is usually of a purple or livid hue, in consequence of the accumulations of the meconium on its inner surface. The meconium, propelled downward by the viscera above, forms a small, roundish prominence, which yields like dough to the pressure of the fingers; but, immediately projects as before, when the pressure is removed. When a fleshy adhesion closes the intestine, the circumstance is obvious to the eye, if the part protrude, which is generally the case. The finger feels greater hardness and resistance, than when there is a mere membrane, and the livid colour of the meconium cannot be seen through the obstructing substance.

These last signs alone are enough to convince the surgeon of the necessity of the operation; but, they do not clearly shew, whether the intestine descends, as far as it ought, in order to form a proper kind of anus. Complete information on this point can only be acquired, after the membrane, or adhesion, has been divided; or else after the child's death, when the operation has proved ineffectual. Though there be no mark to denote, where the anus ought to be situated, and no degree of prominence, yielding, like soft dough, to the pressure of the fingers, and rising again, when such pressure is removed; yet, it may happen, especially on our being consulted immediately after the child is born, that, notwithstanding the absence of such symptoms, denoting the presence of the meconium, and the natural extent of the intestine, as far as where the anus ought to be, the gut may exist, and have a cavity, as far as the membrane, or adhesion, closing it.

When the anus is only covered with skin, and its place pointed out by a prominence, arising from the contents of the

rectum, we have only to make an opening with a knife, sufficient to let out the meconium. Levret recommends making a circular incision in the membrane; but, a transverse cut is sufficient. A small tent of lint is afterwards to be introduced, in order to keep the opening from closing. If the anus should only be partly closed by a membrane, the opening may be dilated with a tent; but, if the aperture should be very small, it is preferable to use the bistoury for its enlargement.

When no external appearance denotes where the situation of the anus ought to be, the case is much more serious and embarrassing; and this, whether the intestine is stopped up by a fleshy adhesion, or the coalescence of its sides, or whether a part of the gut is wanting.

However, it is the surgeon's duty to do every thing in his power to afford relief. For this purpose, an incision, an inch long, is to be made in the situation where the anus ought to be, and the wound is to be carried more and more deeply in the natural direction of the rectum. The cuts are not to be made directly upwards, nor in the axis of the pelvis, for the vagina, or bladder, might thus be wounded. On the contrary, the operator should cut backward, along the concavity of the os coccygis, where there is no danger of wounding any part of importance. In all cases of this kind, the surgeon's finger is the best director. The operator, guided by the index finger of his left hand, introduced within the os coccygis, is to dissect in the direction above recommended, until he reaches the feces, or has cut as far as he can reach with his finger. If he should fail in finding the meconium, as death must unavoidably follow, one more attempt ought to be made, by introducing, upon the finger, a long trocar, in such a direction as seems best calculated for finding the rectum.

By the prudent adoption of such proceedings, many infants have been preserved, which otherwise would have been devoted to certain death. Hildanus, La Motte, Roonhuysen, and many others, have successfully adopted the above practice. Mr. B. Bell informs us, he has seen two of these cases, in which the intestine was very distant from the integuments, and in which he was so successful, as to form an anus, which fulfilled its office tolerably well for several years; but, he found it exceeding difficult to keep the passage sufficiently large and pervious. As soon as he removed the dossils of lint, and other kinds of tents, used for maintaining the necessary dilatation, such a degree of contraction speedily followed, that the evacuation of the intestinal mat-

ter became very difficult, for a long while afterwards. He employed, at different times, tents made of sponge, gentian root, and other substances, which swell on being moistened. But these always produced so much pain and irritation, that it was impossible to persevere in their use. After remarking such inconveniences, he recommends, in opposition to the advice of other authors, not to make use of such tents in these cases. He is of opinion, that whoever makes trial of them upon parts, as sensible as the rectum, will soon find, that the advice of the writers alluded to is ill-founded.

Tents, made of very soft lint, dipped in oil, or rolls of bougie plaster, cause less irritation, than those composed of any other materials.

Though keeping the opening dilated may seem simple and easy, to such men as have had no opportunities of seeing cases of this description, it is far otherwise in practice. Mr. Bell assures us, that he never met with any disease, which gave him so much trouble and embarrassment, as he experienced in the two cases of this sort, which occurred in his practice. Although in both instances he at first made the openings sufficiently large, it was only by very assiduous attention, for eight or ten months, that the necessity for another operation, and even repeated ones, was prevented. When only the skin has been divided, the rest of the treatment is doubtless more simple; for, then, nothing more is requisite, than keeping a piece of lint, for a few days, in the opening made with the knife. But, when the extremity of the rectum is at a certain distance, though we may generally hope to effect a cure, after having succeeded in giving vent to the intestinal matter; yet, the treatment, after the operation, will always demand a great deal of attention and care on the part of the surgeon, for a long while. The difficulty of success may be considered as, in some measure, proportioned to the depth of the necessary incision.

Sometimes, while the anus appears previous and well-formed, infants suffer the same symptoms, as if there were no anus at all. The reason of this depends upon the intestine being occasionally closed by a membranous partition, situated more or less upward, above the aperture of the anus, and, sometimes the symptoms are owing to the termination of the gut in a cul-de-sac. This erroneous formation may always be suspected, whenever an infant, whose anus is externally open, does not void any excrement, for two or three days after its birth, and, especially, when urgent symptoms arise, such as swelling of the belly, vomiting, &c. We are now

to endeavour to ascertain, whether the rectum is impervious above the anus, by attempting to inject glysters, or to introduce a probe. If the gut be shut up, there is nothing to be done, but having recourse to the method described above, and forming a communication by means of a bistoury guided on the finger, or else with a pharyngotomus. If the obstacle should only consist of a transverse membrane, the operation will be easy, and its success almost certain. But, if there should be a strangulation, or obstruction of the intestine, the case is infinitely more serious. However, as the operation is the only resource for saving the child's life, we ought not to hesitate about performing it.

When the anus is imperforate, the intestine sometimes opens into the vagina, or bladder. The first of these cases is the least dangerous of all the malformations of this sort. The intestine may also open, and terminate at two places, at the same time, viz. at the usual place, so as to form a proper anus, more or less perfect; and also in the vagina.

If these two openings should be ample enough for the easy evacuation of the excrement, nothing can be done at so tender an age; for, though voiding the feces through the vagina, is a most unpleasant inconvenience, yet, there is no effectual means of closing the opening of the intestine in this situation, nor could one be devised, which would not seriously incommodate the infant.

But, when the two openings are exceedingly small, and the alvine evacuations cannot readily pass out, even with the aid of glysters, the opening of the anus ought to be dilated by cannulæ of different sizes. If this method should not avail, the knife must be employed, and the wound dressed, as already explained.

For the most part, the intestine has only one opening in the vagina. In this circumstance, as in the instance in which the feces have no vent at all, we must make an incision in that place, which the anus ought to occupy. The natural course of the feces being opened by this operation, which in such a case is not at all perilous, much less excrement will pass out of the vagina, and, of course, the infirmity will be diminished. By the introduction of a tube into the new anus, the communication between the rectum and vagina, might possibly be obliterated, and a perfect cure accomplished. The opening between the intestine and vagina, may, also, be too small for the easy evacuation of the feces, and this might even expose the infant to the same sort of dan-

gerous symptoms, as it would be subject to, if the rectum had positively no opening at all.

In male infants, the rectum sometimes opens into the bladder, and, in this circumstance, there is generally no anus. The case is easily known by the meconium being blended with the urine, which acquires a thick greenish appearance, and is voided almost continually, though in small quantities. The most fluid part of the meconium, is the only one voided in this manner. The thicker part not getting from the rectum into the bladder, nor from the bladder into the urethra, greatly distends the intestines and bladder, and produces the same symptoms, as take place, in cases of total imperforation. Hence, without the speedy interference of art to form an anus, capable of giving vent to the feces, with which the urinary organs cannot remain obstructed, the infant will inevitably die. This case must, therefore, be treated like the foregoing ones. Though we can hardly hope to completely prevent the inconveniences, resulting from the rectum opening into the bladder, since even a new passage will not completely hinder the feces from following the other course; yet, we shall thus afford the child a very good chance of preservation, and the only one which its situation will allow.

In cases, in which we cannot procure an outlet for the feces, by any of the methods pointed out above, it has been proposed to make an opening into the abdomen above the pubes, or on the right side, in order to get at the colon, and form an artificial anus, in one of these situations. But the prospect of success would be so small, that the plan is not likely to be much adopted. (See *De la Médecine Opératoire par Sabatier, Tom. 1. Also Remarques sur Différens Vices de Conformation, que les Enfants apportent en naissant Par M. Petit, in Mem. de l'Acad. Royale de Chirurgie, Tom. 2, p. 236, Edit. in 12mo. Richerand's Nosographie Chirurgicale, Tom. 3, p. 415, &c. Edit. 2.*)

ABSCESSSES OF THE ANUS.—FISTULA IN ANO.

The custom of giving the appellation of *fistula* to every collection of matter formed near to the anus, has, by conveying a false notion of them, been productive of such methods of treating them, as are diametrically opposite to those which ought to be pursued.

A small orifice or outlet from a large or deep cavity, discharging a thin gleet, or sanies, made a considerable part of the idea, which our ancestors had of a fistulous sore, wherever seated. With the

term *fistulous*, they always connected a notion of callosity: and, therefore, whenever they found such a kind of opening yielding such sort of discharge, and attended with any degree of induration, they called the complaint a *fistula*. Imagining this callosity to be a diseased alteration made in the very structure of the parts, they had no conception that it could be cured by any means, but by removal with a cutting instrument, or by destruction with escharotics: and, therefore, they immediately attacked it with knife or caustic, in order to accomplish one of these ends: and very terrible work they often made.

That abscesses, formed near the fundament, do sometimes, from bad habits, from extrinsic neglect, or from gross mistreatment, become fistulous, is certain; but the majority of them have not, at first, any one character or mark of a true fistule; nor can, without the most supine neglect on the side of the patient, or the most ignorant mismanagement on the part of the surgeon, degenerate, or be converted into one.

Collections of matter from inflammation (wherever formed) if they be not opened in time, and in a proper manner, do often burst. The hole, through which the matter finds vent, is generally small, and not often situated in the most convenient, or most dependent part of the tumour: it therefore is unfit for the discharge of all the contents of the abscess; and, instead of closing, contracts itself to a smaller size, and becoming hard at its edges, continues to drain off what is furnished by the undigested sides of the cavity.

When an abscess about the anus bursts, the smallness of the accidental orifice; the hardness of its edges; its being found to be the outlet from a deep cavity; the daily discharge of a thin, gleety, discoloured kind of matter; and the induration of the parts round about, have all contributed to raise, and confirm the idea of a true fistula.

Upon this idea was built the old pernicious doctrine of free excision, or as free destruction.

Abscesses about the anus present themselves in different forms.

Sometimes the attack is made with symptoms of high inflammation; with pain, fever, rigor, &c. and the fever ends as soon as the abscess is formed.

In this case, a part of the buttock near to the anus is considerably swollen, and has a large circumscribed hardness. In a short time, the middle of this hardness

becomes red, and inflamed; and in the center of it matter is formed.

This (in the language of our ancestors) is called in general a *phlegmon*; but when it appears in this particular part, a *phyma*.

The pain is sometimes great, the fever high, the tumour large, and exquisitely tender; but however disagreeable the appearances may have been, or however high the symptoms may have risen, before suppuration, yet, when that end is fairly and fully accomplished, the patient generally becomes easy and cool; and the matter formed under such circumstances, though it may be plentiful, yet is good.

On the other hand, the external parts, after much pain, attended with fever, sickness, &c. are sometimes attacked with considerable inflammation, but without any of that circumscribed hardness, which characterised the preceding tumour; instead of which, the inflammation is extended largely and the skin wears an erysipelatous kind of an appearance. In this, the disease is more superficial; the quantity of matter small, and the cellular membrane sloughy to a considerable extent.

Sometimes, instead of either of the preceding appearances, there is formed in this part, what the French call *une suppuration gangreneuse*; in which the cellular and adipose membrane is affected in the same manner, as it is in the disease called a carbuncle.

In this case the skin is of a dusky red, or purple kind of colour; and although harder than when in a natural state, yet it has, by no means, that degree of tension or resistance, which it has either in the phlegmon, or in the erysipelas.

The patient has generally, at first, a hard, full, jarring pulse, with great thirst, and very fatiguing restlessness. If the progress of the disease be not stopped, or the patient relieved by medicine, the pulse soon changes into an unequal, low, faltering one; and the strength and the spirits sink in such manner, as to imply great and immediately impending mischief. The matter formed under the skin, so altered, is small in quantity, and bad in quality; and the adipose membrane is gangrenous and sloughy throughout the extent of the discolouration. This generally happens to persons whose habit is either naturally bad, or rendered so by intemperance.

In each of these different affections, the whole malady is often confined to the skin.

and cellular membrane underneath it; and no other symptoms attend, than the usual general ones, or such as arise from the formation of matter or sloughs in the part immediately affected. But it also often happens, that, added to these, the patient is made unhappy by complaints arising from an influence, which such mischief has on parts in the neighbourhood of the disease; such as the urinary bladder, the vagina, the urethra, the hæmorrhoidal vessels, and the rectum; producing retention of urine, strangury, dysury, bearing down, tenesmus, piles, diarrhœa, or obstinate costiveness: which complaints are sometimes so pressing, as to claim all our attention. On the other hand, large quantities of matter, and deep sloughs are sometimes formed, and great devastation committed on the parts about the rectum, with little or no previous pain, tumour, or inflammation.

Sometimes the disease makes its first appearance in an induration of the skin, near the verge of the anus, but without pain or alteration of colour; which hardness gradually softens and suppurates. The matter, when let out, in this case, is small in quantity, good in quality; and the sore is superficial, clean, and well-conditioned. On the contrary, it now and then happens, that although the pain is but little, and the inflammation apparently slight, yet the matter is large in quantity, bad in quality, extremely offensive, and proceeds from a deep crude hollow, which bears an ill-natured aspect.

The place also where the abscess points, and where the matter, if let alone, would burst its way out, is various and uncertain. Sometimes it is in the buttock, at a distance from the anus; at other times near its verge, or in the perineum: and this discharge is made sometimes from one orifice only, sometimes from several. In some cases, there is not only an opening through the skin externally, but another through the intestine into its cavity: in others, there is only one orifice, and that either external, or internal.

Sometimes the matter is formed at a considerable distance from the rectum, which is not even laid bare by it; at others, it is laid bare also, and not perforated; it is also sometimes not only denuded, but pierced; and that in more places than one.

All consideration of preventing suppuration, is generally out of the question: and our business, if called at the beginning, must be to moderate the symptoms; to forward the suppuration; when the matter is formed, to let it out; and

to treat the sore in such manner, as shall be most likely to produce a speedy and lasting cure.

When there are no symptoms which require particular attention, and all that we have to do is to assist the maturation of the tumour, a soft poultice is the best application. When the disease is fairly of the phlegmonoid kind, the thinner the skin is suffered to become, before the abscess be opened, the better: as the induration of the parts about will thereby be the more dissolved, and, consequently, there will be the less to do after such opening has been made. This kind of tumour is generally found in people of full, sanguine habits; and who, therefore, if the pain be great, and the fever high, will bear evacuation, both by phlebotomy, and gentle cathartics: which is not often the case of those, who are said to be of bilious constitutions; in whom the inflammation is of a larger extent, and in which the skin wears the yellowish tint of the erysipelas; persons of such kind of habit, and in such circumstances, being in general seldom capable of bearing large evacuation.

When the inflammation is erysipelatous the quantity of matter formed is small, compared with the size and extent of the tumour; the disease is rather a sloughy, putrid state of the cellular membrane, than an imposthumation; and therefore, the sooner it is opened, the better: if we wait for the matter to make a point, we shall wait for what will not happen; at least, not till after a considerable length of time: during which, the disease in the membrane will extend itself, and, consequently, the cavity of the sinus, or abscess, be thereby greatly increased.

When, instead of either of the preceding appearances, the skin wears a dusky, purplish-red colour; has a doughy, unresisting kind of feel, and is very little sensible: when these circumstances are joined with an unequal, faltering kind of pulse, irregular shiverings, a great failure of strength and spirits, and inclination to doze, the case is formidable, and the event generally fatal.

The habit, in these circumstances, is always bad; sometimes from nature, but much more frequently from gluttony and intemperance. What assistance art can lend, must be administered speedily; every minute is of consequence; and if the disease be not stopped, the patient will sink. Here is no need for evacuation of any kind: recourse must be immediately had to medical assistance; the part affected should be frequently fomented with hot spirituous fomentations; a large and deep incision should be made into

the diseased parts, and the application made to it should be of the warmest, most antiseptic kind.

This also is a general kind of observation, and equally applicable to the same sort of disease in any part of the body. Our ancestors have thought fit to call it in some a carbuncle, and in others, by other names; but it is (wherever seated) really and truly, a gangrene of the cellular and adipose membrane; it always implies great degeneracy of habit, and, most commonly, ends ill.

Strangury, dysury, and even total retention of urine, are no very uncommon attendants upon abscesses forming in the neighbourhood of the rectum and bladder; more especially, if the seat of them be near the neck of the latter.

They sometimes continue from the first attack of the inflammation, until the matter is formed, and has made its way outward; and sometimes last a few hours only.

The two former most commonly are easily relieved by the loss of blood, and the use of gum-arabic, with nitre, &c. But in the last (the total retention,) they who have not often seen this case, generally have immediate recourse to the catheter; but the practice is essentially wrong.

The neck of the bladder does certainly participate, in some degree, in the said inflammation. But, the principal part of the complaint arises from irritation, and the disease is, strictly speaking, spasmodic. The manner in which an attack of this kind is generally made; the very little distention which the bladder often suffers; the small quantity of urine sometimes contained in it, even when the symptoms are most pressing; and the most certain, as well as safe, method of relieving it; all tend to strengthen such opinion.

But whether we attribute the evil to inflammation or to spasmodic irritation, whatever can, in any degree, contribute to the exasperation of either, must be manifestly wrong. The violent passage of the catheter through the neck of the bladder (for violent in such circumstances it must be) can never be right.

If the instrument be successfully introduced, it must either be withdrawn as soon as the bladder is emptied, or it must be left in it: if the former be done, the same cause of retention remaining, the same effect returns; the same pain and violence must again be submitted to, under (most likely) increased difficulties. On the other hand, if the catheter be left in the bladder, it will often, while its neck is in this state, occasion such disturbance, that the

remedy (as it is called) will prove an exasperation of the disease, and add to the evil it is designed to alleviate; nor is this all; for the resistance which the parts, while in this state, make, is sometimes so great, that if any violence be used, the instrument will make for itself a new route in the neighbouring parts, and lay the foundation of such mischief as frequently baffles all our art.

The true, safe, and rational method of relieving this complaint is by evacuation and anodyne relaxation: this not only procures immediate ease, but does, at the same time, serve another very material purpose; which is that of maturing the abscess. Loss of blood is necessary; the quantity to be determined by the strength and state of the patient: the intestines should also be emptied, if there be time for so doing, by a gentle cathartic; but the most effectual relief will be from the warm bath, or semicupium, the application of bladders with hot water to the pubes and perineum, and, above all other remedies, the injection of glysters, consisting of warm water, oil, and opium. There may have been cases which have resisted and baffled this method of treatment; but Pott has never met with them.

A painful tenesmus is no uncommon attendant upon an inflammation of the parts about the rectum.

If a dose of rhubarb, joined with a warm anodyne, such as the conf. mithrid. or suchlike, does not remove it, the injection of thin starch and opium, or tinct. thebaic. is almost infallible.

The bearing down, in females, as it proceeds in this case, from the same kind of cause (*viz.* irritation) admits relief from the same means as the tenesmus.

In some habits an obstinate costiveness attends this kind of inflammation, accompanied, not unfrequently, with a painful distention and enlargement of the hemorrhoidal vessels, both internally and externally. While a quantity of hard feces are detained within the large intestines, the whole habit must be disordered; and the symptomatic fever, which necessarily accompanies the formation of matter, must be considerably heightened. And which the vessels surrounding the rectum (which are large and numerous) are distended, all the ills proceeding from pressure, inflammation, and irritation, must be increased. Phlebotomy, laxative glysters, and a low, cool regimen, must be the remedies; while a soft cataplasm applied externally serves to relax and mollify the swollen, indurated piles, at the same time that it hastens the suppuration.

When the abscesses have formed, and are fit to be opened, or when they have

already burst, they may be reduced to two general heads, viz.

1. Those, in which the intestine is not at all interested; and,
2. Those, in which it is either laid bare, or perforated.

In making the opening, the knife or lancet should be passed in deep enough to reach the fluid; and, when it is in, the incision should be continued upward and downward, in such manner as to divide all the skin covering the matter. By these means, the contents of the abscess will be discharged at once; future lodgment of matter will be prevented; convenient room will be made for the application of proper dressings; and there will be no necessity for making the incision in different directions, or for removing any part of the skin composing the verge of the anus.

Notwithstanding all these collections of matter are generally called *fistule*, and are all supposed to affect the intestinum rectum, yet it is very certain that the seat of the abscess, is sometimes at such distance from the gut, that it is not at all interested by it; and that none of these cases either are, or can be originally *fistule*.

In this state of the disease, we have no more necessarily to do with the intestine, than if it was not there; the case is to be considered merely as an abscess in the cellular membrane.

Suppose a large and convenient opening to have been made by a simple incision; the contents of the abscess to have been thereby discharged; and a sore or cavity produced, which is to be filled up.

The term *filling up*, and the former opinion, that the induration of the parts about is a diseased callosity, have been the two principal sources of misconduct in these cases.

The old opinion, with regard to hollow and hardness, was that the former is caused entirely by loss of substance: and the latter, by diseased alteration in the structure of the parts.

The consequence of which opinion was, that as soon as the matter was discharged, the cavity was filled and distended, in order to procure a gradual regeneration of flesh, and the dressings, with which it was so filled, were most commonly of the escharotic kind, intended for the dissolution of hardness.

The practice is a necessary consequence of the theory. Whoever supposes diseased callosity, and great loss of substance, will necessarily think himself obliged to destroy the former, and to prevent the cavity, formed by the latter, from filling up

too hastily. On the other hand, he who regards the cavity of the abscess as being principally the effect of the gradual distraction and separation of its sides, with very little loss of substance, compared with the size of the said cavity; and who looks upon the induration round about, as nothing more than a circumstance which necessarily accompanies every inflammation in membranous parts, more especially in those which tend to suppuration; will, upon the smallest reflection, perceive, that the dressings applied to such cavity ought to be so small in quantity, as to permit nature to bring the sides of the cavity toward each other, and that such small quantity of dressings ought to consist of materials proper only to encourage easy and gradual suppuration.

Suppuration is to be produced and maintained, not by thrusting in such applications, as by their quantity distend, and by their quality irritate and destroy; but by dressing lightly and easily with such as appease, relax and soften.

If the hollow, immediately it is opened, be filled with dressings (of any kind,) the sides of it will be kept from approaching each other, or may even be farther separated. But if this cavity be not filled, or have little or no dressings of any kind introduced into it, the sides immediately collapse; and, coming nearer and nearer, do, in a very short space of time, convert a large hollow into a small sinus. And this is also constantly the case, when the matter, instead of being let out by an artificial opening, escapes through one made by the bursting of the containing parts.

True, this sinus will not always become perfectly closed; but the aim of nature is not, therefore, the less evident; nor the hint, which art ought to borrow from her, the less palpable.

In this, as in most other cases, where there are large sores, or considerable cavities, a great deal will depend on the patient's habit, and the care that is taken of it: if that be good, or if it be properly corrected, the surgeon will have very little trouble in his choice of dressings; only to take care that they do not offend either in quantity or quality: but if the habit be bad, or injudiciously treated, he may use the whole farrago of externals, and only waste his own and his patient's time.

By light, easy treatment, large abscesses formed in the neighbourhood of the rectum will sometimes be cured, without any necessity occurring of meddling with the said gut. But it much more frequently happens, that the intestine, although it

may not have been pierced or eroded by the matter, has yet been so stripped or denuded, that no consolidation of the sinus can be obtained, but by a division; that is, by laying the two cavities, viz. that of the abscess, and that of the intestine, into one.

When the intestine is found to be separated from the surrounding parts by the matter, the operation of dividing it had better (on many accounts) be performed at the time the abscess is first opened, than be deferred to a future one. For, if it be done properly, it will add so little to the pain, which the patient must feel by opening the abscess, that he will seldom be able to distinguish the one from the other, either with regard to time or sensation: whereas, if it be deferred, he must either be in continual expectation of a second cutting, or feel one at a time when he does not expect it.

The intention in this operation is to divide the intestine rectum from the verge of the anus up as high as the top of the hollow in which the matter was formed; thereby to lay the two cavities of the gut and abscess into one; and by means of an open, instead of a hollow or sinuous sore, to obtain a firm and lasting cure.

For this purpose, the curved, probe-pointed knife, with a narrow blade, is the most useful and handy instrument of any. This, introduced into the sinus, while the surgeon's fore-finger is in the intestine, will enable him to divide all that can ever require division; and that with less pain to the patient, with more facility to the operator, as well as with more certainty and expedition than any other instrument whatever. If there be no opening in the intestine, the smallest degree of force will thrust the point of the knife through, and thereby make one: if there be one already, the same point will find and pass through it. In either case, it will be received by the finger in ano; will thereby be prevented from deviating, and being brought out by the same finger, must necessarily divide all that is between the edge of the knife, and the verge of the anus: that is, must by one simple incision (which is made in the smallest space of time imaginable) lay the two cavities of the sinus and of the intestine into one.

Authors make a very formal distinction between those cases in which the intestine is pierced by the matter, and those in which it is not; but although this distinction may be useful when the different states of the disease are to be described, yet in practice, when the operation of dividing the gut becomes necessary, such distinction is of no consequence at all; it

makes no alteration in the degree, kind, or quantity of pain which the patient is to feel; the force required to push the knife through the tender gut is next to none, and when its point is in the cavity, the cases are exactly similar.

Immediately after the operation, a soft dossil of fine lint should be introduced (from the rectum) between the divided lips of the incision; as well to repress any slight hemorrhage, as to prevent the immediate reunion of the said lips; and the rest of the sore should be lightly dressed with the same. This first dressing should be permitted to continue, until a beginning suppuration renders it loose enough to come away easily; and all the future ones should be as light, soft, and easy as possible; consisting only of such materials as are likely to promote kindly and gradual suppuration. The sides of the abscess are large; the incision must necessarily, for a few days, be inflamed; and the discharge will, for some time, be discoloured and gleety: this induration, and this sort of discharge, are often mistaken for signs of diseased callosity, and undiscovered sinuses; upon which presumptions, escharotics are freely applied, and diligent search is made for new hollows: the former of these most commonly increase both the hardness and the gleet; and by the latter new sinuses are sometimes really produced. These occasion a repetition of escharotics, and, perhaps, of incisions; by which means, cases which at first, and in their own nature were simple and easy of cure, are rendered complex and tedious.

To quit reasoning, and speak to fact only: In the great number of these cases, which must have been in St. Bartholomew's Hospital, within these ten or twelve years, *I do aver*, (says Pott) *that I have not met with one, in the circumstances before described, that has not been cured by mere simple division, together with light, easy dressings: and that I have not in all that time, used for this purpose, a single grain of precipitate, or of any other escharotic.*

The best and most proper method of dividing the intestine, in the case of a collection of matter formed juxta anum, we have already described.

The intention to be aimed at by incision in the present case, is exactly the same, and ought to be executed in the same manner.

Let us first suppose the matter to be fairly formed: to have made its points, as it is called; and to be fit to be let out.

Where such point is, that is, where the skin is most thin, and the fluctuation most palpable, there the opening most certainly ought to be made, and always with a

cutting instrument, not caustic, as was formerly done.

We have supposed the matter of the abscess to have been formed, and collected; but still to have been contained within the cavity, until let out by an incision.

We are now to consider it, as having made its own way out, without the help of art.

This state of the disease is also subject to some variety of appearance; and these different appearances have produced, not only a multiplicity of appellations, but a groundless supposition also, of a variety of essentially different circumstances.

When a discharge of the matter by incision is too long delayed or neglected, it makes its own way out, by bursting the external parts somewhere near to the fundament, or by eroding and making a hole through the intestine into its cavity; or sometimes by both. In either case, the discharge is made sometimes by one orifice only, and sometimes by more. Those, in which the matter has made its escape by one or more openings, through the skin only, are called *blind external fistule*; those, in which the discharge has been made into the cavity of the intestine, without any orifice in the skin, are named *blind internal*; and those, which have an opening both through the skin, and into the gut, are called *complete fistule*.

Thus, all these cases are deemed fistulous, when hardly any of them ever are so: and none of them necessarily. They are still mere abscesses, which are burst without the help of art; and, if taken proper and timely care of will require no such treatment as a true fistula may possibly stand in need of.

The most frequent of all are what are called the *blind external*; and the *complete*. The method whereby each of these states may be known is, by introducing a probe into the sinus by the orifice in the skin, while the fore-finger is within the rectum: this will give the examiner an opportunity of knowing exactly the true state of the case, with all its circumstances.

Whether the case be, what is called a complete fistula, or not; that is, whether there be an opening in the skin only, or one there, and another in the intestine, the appearance to the eye is much the same. Upon discharge of the matter, the external swelling subsides, and the inflamed colour of the skin disappears, the orifice, which at first was sloughy and foul, after a day or two are past, becomes clean and contracts in size; but the discharge, by fretting the parts about, renders the patient still uneasy.

As this kind of opening seldom proves sufficient for a cure, (though it sometimes does) the induration, in some degree, remains; and if the orifice happens not to be a depending one, some part of the matter lodges, and is discharged by intervals, or may be pressed out by the fingers of an examiner. The disease, in this state, is not very painful; but it is troublesome, nasty and offensive: the continual discharge of a thin kind of fluid from it, creates heat, and causes excoriation in the parts about; it daubs the linen of the patient; and is, at times, very fetid; the orifice also sometimes contracts so, as not to be sufficient for the discharge; and the lodgment of the matter then occasions fresh disturbance.

The means of cure proposed and practised by our ancestors, were three, viz, caustic, ligature, and incision.

The intention in each of these is the same, viz. to form one cavity of the sinus and intestines by laying the former into the latter. The two first are now completely, and most properly, exploded.

Hitherto we have considered the disease either as an abscess, from which the matter has been let out by an incision, made by a surgeon; or from which the contents have been discharged by one single orifice, formed by the bursting of the skin somewhere about the fundament. Let us now take notice of it, when instead of one such opening, there are several.

This state of the case generally happens when the quantity of matter collected has been large, the inflammation of considerable extent, the adipose membrane very sloughy, and the skin worn very thin before it burst.—It is, indeed, a circumstance of no real consequence at all; but from being misunderstood, or not properly attended to, is made one of additional terror to the patient, and additional alarm to the inexperienced practitioner; for it is taught, and frequently believed, that each of these orifices is an outlet from, or leads to a distinct sinus, or hollow; whereas in truth, the case is most commonly, quite otherwise; all these openings are only so many distinct burstings of the skin covering the matter; and do all, be they few or many, lead and open immediately into the one single cavity of the abscess: they neither indicate, nor lead to, nor are caused by distinct sinuses; nor would the appearance of twenty of them (if possible) necessarily imply more than one general hollow.

If this account be a true one, it will follow, that the chirurgic treatment of this kind of case ought to be very little, if at all, different from that of the pre-

ceding; and that all that can be necessary to be done, must be to divide each of these orifices in such manner as to make one cavity of the whole. This the probe-knife will easily and expeditiously do; and when that is done, if the sore, or more properly its edges, should make a very ragged, uneven appearance, the removal of a small portion of such irregular angular parts will answer all the purposes of making room for the application of dressings, and for producing a smooth, even cicatrix after the sore shall be healed.

When a considerable quantity of matter has been recently let out, and the internal parts are not only in a crude, undigested state, but have not yet had time to collapse, and approach each other; the inside of such cavity will appear large; and if a probe be pushed with any degree of force, it will pass in more than one direction into the cellular membrane by the side of the rectum. But let not the unexperienced practitioner be alarmed at this, and immediately fancy that there are so many distinct sinuses; neither let him, if he be of a more hardy disposition, go to work immediately with his director, knife, or scissors: let him enlarge the external wound by making his incision freely; let him lay all the separate orifices open into that cavity; let him divide the intestine lengthwise by means of his finger in ano; let him dress lightly and easily; let him pay proper attention to the habit of the patient; and wait, and see what a few days, under such conduct, will produce. By this he will frequently find, that the large cavity of the abscess will become small and clean; that the induration round about will gradually lessen; that the probe will not pass in that manner into the cellular membrane; and consequently, that his fears of a multiplicity of sinuses were groundless. On the contrary, if the sore be crammed or dressed with irritating, or escharotic medicines, all the appearances will be different: the hardness will increase, the lips of the wound will be inverted, the cavity of the sore will remain large, crude, and foul; the discharge will be thin, gleety, and discoloured; the patient will be uneasy and feverish; and, if no new cavities are formed by the irritation of parts, and confinement of matter, yet the original one will have no opportunity of contracting itself: and may very possibly become truly fistulous.

Sometimes the matter of an abscess, formed *juxta anum*, instead of making its way out through the skin, externally near the verge of the anus, or in the buttock, pierces through the intestine

only. This is what is called a *blind internal fistula*.

In this case, after the discharge has been made, the greater part of the tumefaction subsides, and the patient becomes easier. If this does not produce a cure, which sometimes, though very seldom, happens, some small degree of induration generally remains in the place where the original tumour was; upon pressure on this hardness, a small discharge of matter is frequently made *per anum*; and sometimes the expulsion of air from the cavity of the abscess into that of the intestine may very palpably be felt, and clearly heard; the stools, particularly, if hard, and requiring force to be expelled, are sometimes smeared with matter; and although the patient, by the bursting of the abscess, is relieved from the acute pain which the collection occasioned, yet he is seldom perfectly free from a dull kind of uneasiness, especially if he sits for any considerable length of time in one posture. The real difference between this kind of case, and that in which there is an external opening (with regard to method of cure) is very immaterial: for an external opening must be made, and then all difference ceases. In this, as in the former, no cure can reasonably be expected, until the cavity of the abscess, and that of the rectum, are made one; and the only difference is, that in the one case we have an orifice at, or near the verge of the anus, by which we are immediately enabled to perform that necessary operation; in the other, we must make one.

We come now to that state of the disease, which may truly and properly be called *fistulous*. This is generally defined, *sinus angustus, callosus, profundus; acrisanæ diffuens*: or, as Dionis translates it, "*Un ulcère profond, & caverneux, dont l'entrée est étroite, & le fond plus large; avec issue d'un pus acre & virulent; et accompagné de callosités.*"

Various causes may produce or concur in producing such a state of the parts concerned as will constitute a fistula, in the proper sense of the word; that is, a deep, hollow sore, or sinus, all parts of which are so hardened, or so diseased, as to be absolutely incapable of being healed, while in that state; and from which a frequent, or daily discharge is made, of a thin, discoloured sanies, or fluid.

These are divided into two classes, viz. those which are the effect of neglect, distempered habit, or of bad management, and which may be called, without any great impropriety, local diseases; and those which are the consequence of dis-

orders, whose origin and seat is not in the immediate sinus or fistula, but in parts more or less distant, and, which, therefore, are not local complaints.

The natures and characters of these are obviously different by description; but they are still more so in their most frequent event, the former being generally curable by proper treatment; the latter frequently not so by any means whatever.

Under the former are reckoned all such cases as were originally mere collections of matter within the coats of the intestine rectum, or in the cellular membrane surrounding the said gut; but which, by being long neglected, grossly managed, or, by happening in habits which were disordered, and for which disorders no proper remedies were administered, suffer such alteration, and get into such state, as to deserve the appellation of *fistule*.

Under the latter, are comprised all those cases in which the disease has its origin and first state in the higher and more distant parts of the pelvis, about the os sacrum, lower vertebræ of the loins, and parts adjacent thereto; and are either strumous, or the consequence of long and much distempered habits; or the effect of, or combined with other distempers, local, or general; such as a diseased neck of the bladder, or prostate gland, or urethra, &c. &c. &c.

Among the very low people, who are brought into hospitals, we frequently meet with cases of the former kind: cases, which, at first, were mere simple abscesses; but which from uncleanness, from intemperance, negligence, and distempered constitutions, become such kind of sores, as may be called *fistulous*.

In these the art of surgery is undoubtedly, in some measure, and at some time, necessary; but it very seldom is the first or principal fountain from whence relief is to be sought: the general effects of intemperance, debauchery, and diseases of the habit are first to be corrected and removed, before surgery can with propriety, or with reasonable prospect of advantage be made use of.

The surgery required in these cases, consists in laying open and dividing the sinus, or sinuses, in such manner that there may be no possible lodgment for matter, and that such cavities may be fairly opened lengthwise into that of the intestine rectum: if the internal parts of these hollows are hard, and do not yield good matter, which is sometimes the case more especially where attempts have been made to cure by injecting astringent liquors, such parts should be lightly

scratched or scarified with the point of a knife or lancet, but not dressed with escharotics; and if, either from the multiplicity of external orifices, or from the loose, flabby, hardened, or inverted state of the lips and edges of the wound near to the fundament, it seems very improbable that they can be got into such a state as to heal smooth and even, such portion of them should be cut off as may just serve that purpose. The dressings should be soft, easy, and light; and the whole intent of them to produce such suppuration as may soften the parts, and may bring them into a state fit for healing.

If a loose, fungous kind of flesh has taken possession of the inside of the sinus, (a thing much talked of, and very seldom met with) a slight touch of the lunar caustic will reduce it sooner, and with better effect on the sore, than any other escharotic whatever.

The method and medicines by which the habit of the patient was corrected, must be continued (at least in some degree) through the whole cure; and all those excesses and irregularities which may have contributed to injure it, must be avoided.

By these means, cases which at first have a most disagreeable and formidable aspect, are frequently brought into such state, as to give very little trouble in the healing.

If the bad state of the sore arises merely from its having been crammed, irritated, and eroded; the method of obtaining relief is so obvious, as hardly to need recital.

A patient who has been so treated, has generally some degree of fever; has a pulse which is too hard, and too quick; is thirsty, and does not get his due quantity of natural rest. A sore which has been so dressed, has generally a considerable degree of inflammatory hardness round about; the lips and edges of it are tumid, full, inflamed, and sometimes inverted; the whole verge of the anus is swollen; the hæmorrhoidal vessels are loaded; the discharge from the sore is large, thin, and discoloured; and all the lower part of the rectum participates of the inflammatory irritation, producing pain, bearing-down, tenesmus, &c. *Contraria contrariis* is never more true than in this instance: the painful, uneasy state of the sore, and of the rectum, is the great cause of all the mischief, both general and particular; and the first intention must be to alter that. All escharotics must be thrown out, and disused; and in lieu of them, a soft digestive should be substituted, in such manner as not to

cause any distention, or to give any uneasiness from quantity; over which a poultice should be applied: these dressings should be renewed twice a day; and the patient should be enjoined absolute rest. At the same time, attention should be paid to the general disturbance, which the former treatment may have created. Blood should be drawn off from the sanguine; the feverish heat should be calmed by proper medicines; the languid and low should be assisted with the bark and cordials; and ease in the part must, at all events, be obtained by the injection of anodyne clysters of starch and opium.

If the sinus has not yet been laid open, and the bad state of parts is occasioned by the introduction of tents imbued with escharotics, or by the injection of astringent liquors, (the one for the destruction of callosity, the other for the drying up of gleet and humidity) no operation of any kind should be attempted until both the patient and the parts are easy, cool, and quiet: cataplasms, clysters, rest, and proper medicines must procure this; and when that is accomplished, the operation of dividing the sinus, and (if necessary) of removing a small portion of the ragged edges, may be executed, and will, in all probability, be attended with success. On the contrary, if such operation be performed while the parts are in a state of inflammation, the pain will be great, the sore for several days very troublesome, and the cure prolonged or retarded, instead of being expedited.

Abscesses, and collections of diseased fluids are frequently formed about the lumbar vertebra, under the psoas muscle, and near to the os sacrum; in which cases, the said bones are sometimes carious, or otherwise diseased. These sometimes form sinuses, which run down by the side of the rectum, and burst near to the fundament.

The chirurgic treatment of such sores and sinuses can have little influence on the remote situation, where the collection of matter is originally formed. (See *Lumbar Abscess*.)

Fistulous sores, sinuses, and indurations about the anus, which are consequences of diseases of the neck of the bladder, and urethra, called fistulae in perinaeo, require separate and particular consideration. (See *Fistula in Perinaeo*.)

Poit may be considered as the source and authority of the foregoing remarks.

For information, relative to former opinions concerning *fistula in ano*, refer to *Celsus*; *Heister's Surgery*; *Le Dran's Operations*; *Sharp's Operations*; *La Faye's Notes on Dionis*. In *Kirkland's Medical Surge-*

ry, Vol. 2, may be found an account of the opinions and practice of many former celebrated practitioners. The best modern practical remarks are contained in *Pott's Treatise on the Fistula in Ano*, in which he has offered also an excellent critique on some opinions of *Le Dran*, *De la Faye*, and *Cheselden*. The reader may also consult with advantage *Sabatier's Médecine Opératoire, Tom. 2*; *B. Bell's Surgery, Vol. 2*; *Latta's Surgery, Vol. 2*.

ANUS, PROLAPSUS OF.

When a portion of the rectum is protruded out of the anus, in a preternatural degree, the disorder is termed *prolapsus ani*. Sometimes, only a very small part of the gut is thus displaced; on other occasions, there is a very considerable portion of it.

The sphincter ani, and the surrounding parts, serve, in the healthy state, as a base, and support, for the lower part of the rectum, and every thing, which tends to weaken them, tends, also, to produce a prolapsus ani.

The most common cause of this disease, however, is referrible to too violent and repeated exertions of the rectum itself, excited by some source of irritation about the extremity of this intestine. Thus, the too frequent employment of aloetic medicines, the action of which particularly affects the large intestines, often occasions the above consequence. The same thing results from small worms, known by the name of ascarides, and which, lodging about the lower part of the rectum, occasionally cause excessive irritation. Habitual costiveness; hemorrhoids; in a word, every thing, which by stimulating the rectum, excites too violent an action of this intestine, may induce the complaint under consideration.

There are numerous instances in which a prolapsed portion of the rectum has remained, for a long while, unreduced, and in which, notwithstanding such neglect, no serious bad consequences have ensued. It follows from this, that this bowel can bear exposure to the external air much better, than any other part of the intestinal canal. But, we ought never, on this account, to omit doing every thing in our power for the immediate reduction of the intestine. Authors of surgical works have, not uncommonly, recommended fomenting the prolapsed part with emollient and antiseptic decoctions, before making an attempt to reduce it. They even advise the operator, for the purpose of succeeding with more ease, to cover his fingers with

linen, smeared with wax and oil. But, all such preparations are useless, and, when a surgeon is called to a patient afflicted with a prolapsus ani, the greatest service he can render, is to put back the displaced part, as quickly as possible, into its natural situation, without leaving the intestine exposed to the dangerous effects, which may arise during the time wasted in employing fomentations, &c. Also, as much greater manual dexterity can be made use of, when the fingers are perfectly uncovered, than when they have greasy gloves on, it is best not to follow the latter method. However, if it should be judged proper to cover the hands with any thing, a piece of fine cotton will best answer the purpose.

The patient being in bed, lying upon his side, or, what is better, on the abdomen, while his buttocks are raised rather higher than the rest of the body, the surgeon is to make strong, but equal pressure, with the palm of his hand on the lower portion of the prolapsed intestine. By continuing such pressure, the intestine may, in general, be easily reduced. But if this plan should not suffice, the upper part of the protruded intestine must be compressed with the fingers of one hand, while the lower part is pressed upwards by the palm of the other one. In this way, we are almost sure to succeed. It is true, that if, in consequence of having too long delayed the reduction, or from some other cause, the gut has become much swollen and inflamed, it will be impossible to reduce the part, before such symptoms have been subdued. For this purpose, it may be proper to take some blood from the patient, in such quantity, as his strength will allow. The intestine may also be fomented with a warm solution of the acetate of lead, (*saccharum saturni*.) When the swelling has been diminished by these means, there will be no difficulty in replacing the parts, by pursuing the plan already explained.

The greatest difficulty is not the returning of the intestine, but keeping it in its place. The latter object often gives a great deal of trouble. For, after the bowel has frequently descended, the sphincter sometimes becomes so weakened, that it can no longer keep the part supported. Hence, the complaint not only recurs whenever the patient goes to stool; but, even whenever he walks, or places himself in an erect posture; as there are examples of.

Different bandages have been devised, for supporting the anus after its reduction. But, it is not an easy matter to invent one, which is in every respect adapt-

ed to what such an inconvenience requires. A compress, doubled several times, is usually applied to the anus, and supported in this position by means of a T bandage. In many cases, this method of keeping up the intestine answers very well. A machine was invented by Mr. Gooch, which has the double advantage of supporting the intestine more securely, than any other, with which we are acquainted, and of allowing the patient to take a great deal more exercise, than he could do without its assistance. (See *Gooch's Chirurgical Works*, Vol. 2, p. 150. Edit. 1792.)

But, what, in our opinion, is still better than all such contrivances, are elastic gum pessaries, which were invented a few years ago by M. Bernard, an ingenious artist, who has employed this substance for making various articles, which are used by surgeons. The instrument, which we have just mentioned, consists of an oblong oval body, rounded at one end, and terminating at the other in a narrow, rather long neck, with a flat border at its extremity. The body of this instrument, when introduced into the intestine beyond the sphincter, dilates and supports the gut, while the sphincter embraces its neck, and the border of this part of the instrument hinders it from ascending too far up the rectum. A string is also attached to the edge, which tends to prevent the occurrence. This pessary is very smooth, and, consequently, cannot do any injury to the parts. It is also very light, being only composed of a very thin, though tolerably solid substance. As it is pierced at its termination, it does not impede the discharge of air, which might otherwise incommode the patient.

When the intestine is protruded at the time the patient is at stool, the part is to be immediately replaced. This the patient should accustom himself to do without assistance, and then the bandage, or pessary, is to be applied. In order to strengthen the sphincter ani and adjacent parts, the weakness of which must, in the majority of cases, be regarded as the entire cause of the disease, the patient should take preparations of bark and steel, make use of the cold bath, and frequently have cold water dashed against his buttocks and loins. Astringent injections, particularly, such as are composed of an infusion of gall-nuts, or oak-bark, are also very serviceable. A small quantity of alum, or sugar of lead, has sometimes been added to these injections; but, in general, all additions of saline substances are to be deemed improper, because salts usually produce an irritation of the intestine.

Diseases of this kind may always be cured, or at least palliated, so as to be very bearable, by the employment of some of the above means.

Before concluding this article, we shall observe, however, that a much more serious disorder has been confounded with the prolapsus ani; viz. one, in which a considerable portion of the colon, cæcum, and, even sometimes, of the ilium, becomes everted and pushed out at the anus. The generality of practitioners consider this occurrence in the same point of view, as the disease of which we have just been treating. In this case, they believe that the whole of the rectum becomes everted, in consequence of the relaxation of the sphincter and levatores ani, and, that it then draws after it other portions of the intestinal canal. But, they ought to have been undeceived by the strangulation, which sometimes occurs under such circumstances, and which not only throws a great obstacle in the way of the reduction of the displaced part, but even sometimes brings on mortification. Besides the connexions of the rectum with the neighbouring parts, by means of the cellular substance, which surrounds it; and the attachment of this intestine to the posterior surface of the urinary bladder; render the above origin of the complaint impossible. Such an explanation could only be admitted with regard to those protrusions of the rectum, which come on in a very slow manner. This account could not afford a satisfactory explanation of certain cases, in which the everted intestine presents a very enormous tumour. Fabricius ab Aquapendente mentions his having seen tumours occasioned by a prolapsus of the rectum, which were as long as the forearm, and as large as the fist. In the *Mélanges des Curieux de la Nature*, we find an account of a tumour of this sort, which was two feet long, and occurred in a woman from parturition. Nor is a more satisfactory reason assigned for these cases, by supposing, that they originate from a relaxation of the villous coat of the rectum, and its separation from the muscular one. We are not authorized to imagine, that such a separation can take place to a considerable extent, nor so suddenly, as to give rise to the phenomena, sometimes remarked in this disease.

But more accurate observations have removed all doubt upon this subject. In the eleventh volume of the *Mémoires de l'Académie de Chirurgie*, edit. in 12mo. we read an account of a pretended prolapsus of the rectum, which, after death was discovered to be an eversion of the cæcum, the greater part of the colon being

found at the lower end of this intestine, and most of the rectum at its upper part. This eversion began at the distance of more than eleven inches from the anus, and terminated about five or six from this opening, the tumour, formed by the disease, having been reduced some time before the child's death. It was impossible to draw back the everted part, in consequence of the adhesions, which it had contracted. Another dissection has evinced the same fact. A child, having suffered very acute pain in the abdomen, after receiving a blow, had a prolapsus of intestine through the anus, about six or seven inches long. This was taken for a prolapsus of the rectum. After death, the termination of the bowel out of the anus, was found to be nothing less than the cæcum, which had passed through the colon, and rectum, and made a protrusion at the anus. See *Intussusceptio*. (For information on the preceding subject, the reader may consult with advantage, l'Encyclopédie Méthodique, Partie Chirurgicale, De la chute du fondement, Tom. 1, p. 150. Gooch's *Chirurgical Works*, Vol. 2, p. 150. Edit. 1792. *Recherches Historiques, sur la Gastrotomie, ou l'ouverture du bas-ventre, dans le cas du Volvulus, &c.* par M. Mevin in *Mem. de l'Acad. Royale de Chirurgie*, Tom. 11, p. 315. Edit. in 12mo. *Richerand's Nosographie Chirurgicale*, Tom. 3, p. 421, &c. *Richer's Anfangsgrunde der Wundarzneykunst*, Band 6. Von dem Vor-falle aus dem Hintern, p. 403. Edit. 1802.

ANUS, ARTIFICIAL.

This signifies an accidental opening in the parietes of the abdomen, to which opening some part of the intestinal canal tends, and through which the feces are, either wholly, or in part, discharged.

When a strangulated hernia occurs, in which the intestine is simply pinched, and this event is unknown; when the occurrence has not been relieved by the usual means; or when the necessary operation has not been practised in time; the protruded part becomes gangrenous, and the feces escape. Putrefaction takes place in the cellular substance, and under the adjoining integuments, while the gangrenous affection of the tumour spreads from within outward. One or more openings soon form in the mortified parts, and through these apertures the feces are discharged, until the separation of the sloughs gives a freer vent to the excrement. But if the patient should be at last operated upon, his feces are discharged through the wound, and the intestines are more easily emptied. In both cases, the excrement continues to

be discharged from the opening, when the loss of substance in the intestine is great, and a considerable contraction of the bowels has taken place below the part affected. When the mortification has been too extensive, and the cicatrix, following the detachment of the dead parts, has greatly diminished the diameter of the bowels, the feces more readily pass out of the wound, than along the intestinal canal, and, consequently, they are entirely discharged through the artificial opening. In this way, an artificial anus is formed, through which the excrement is evacuated during life.

The same occurrence may follow wounds, penetrating the abdomen, and doing considerable injury to the intestines. The inflammation, which always accompanies such wounds, occasions salutary adhesions, between the edges of the divided intestine and those of the opening in the peritoneum and muscles. This prevents any extravasation of matter in the abdomen. The fixed and permanent situation of the large intestines renders all wounds occurring to them, much more prone, than those befalling the small intestines, to this consequence, so favourable in many respects. However, artificial anuses have been known to form after wounds of the small intestines. A case of this sort may be perused in Fernel, and a second in Bauhin. (*Sabatier sur les Anus contre Nature, in Mem. de l'Acad. de Chir. Tom. 5. Edit. in 12mo*.)

In cases of hernia with gangrene, an artificial anus is formed, under the above circumstances, according to the design of nature, and it would frequently be wrong to hinder the occurrence, even though it were practicable to heal the wound, which is the situation of it. For, the intestine being too much contracted at the place of the cicatrix, the patient would continue subject to cholic complaints. In this manner, he might be put in more or less immediate danger of perishing from a bursting of the intestinal canal within the abdomen, or else from a simple obstruction in the cavity of the bowels. This is not the case, when an artificial anus is formed, in consequence of a wound of the intestines, and, if the patient could receive timely succour, before such a consequence had completely taken place, possibly, the event might often be prevented.

Howsoever advantageous the formation of an artificial anus may be, in many cases, in which the patient's life depends upon the event, it must be confessed, that the consequence is a most afflicting and disgusting infirmity. It is true, however,

that the matter, which is discharged, not having been long retained in the bowels, is not so fetid as that which is evacuated in the ordinary way; but, as the opening which gives vent to the matter is not endowed with the same organization as the lower end of the rectum, and, as in particular, it is not furnished with any sphincter capable of contracting and relaxing itself, as occasion requires, the feces are continually escaping without any knowledge of the circumstance on the part of the patient. Some persons in this state, among the number of those whose histories are on record, have made use of a metal box, in which their excrement has been received. Schenckius relates the case of an officer, who was wounded in the belly, and who allowed his feces to escape into a vessel made for the purpose. Dionis makes mention of a similar case. What occurred to an invalid soldier, says this eminent writer, is too singular to serve as an example in practice, since nature alone preserved him, by making the wound of the abdomen serve as an opening for the discharge of his feces. The intestine has become adherent to it, and he daily evacuates his excrement through this opening. The matter coming away involuntarily, necessitates him to have a tin-box for its reception.

M. Moscati, principal surgeon of the hospital at Milan, has also communicated to the academy of surgery, an account of a wounded man, in whom an artificial anus took place, in consequence of a wound in the abdomen below the right hypochondrium. His excrement used also to be received in a tin-box, fastened to him by a belt. The above surgeon very properly remarks, as a truly singular circumstance in this wound, that it admitted of a leaden cannula being introduced, to which cannula the tin-box was accommodated. But, would the situation of wounds, liable to be followed by an artificial anus, be always sufficiently favourable, to allow of the intestinal matter being received in an appropriate vessel? May not the pressure, which the edges of such vessels are apt to make on the circumference of the opening, be detrimental? Lastly, would not such a vessel, though apparently fixed in a suitable manner, change its position, and sometimes allow the feces to escape on the patient's clothes?

Uncleanliness is not the only inconvenience of an artificial anus. Persons have been known to be quite debilitated by the affliction, and even ultimately to die in consequence of it. This is liable to happen, whenever the intestinal canal is opened very high up, so that ali-

ment escapes before chylication is completed, and the nutritious part of the food has been taken up by the lacteals. But, when the opening only interests the lower circinvolutions of the ilium, or, what is more frequent, when it has occurred in the large intestines, the danger, to which the patient is exposed by this event, is rendered very trivial. There is no fact of this kind recorded, which had a fatal termination; on the contrary, many writers confirm, that such patients as they have seen with an artificial anus, have been healthy and well-looking.

The most grievous occurrence, to which persons with an artificial anus are exposed, is a prolapsus of the bowel, similar to what sometimes happens through the anus, with respect to the rectum. The descent of the bowel is sometimes simple, only affecting a portion of the intestinal canal just above or below the opening. On other occasions the complaint is double, the bowel both above and below the opening being prolapsed. This descent of the intestine forms a tumour, the dimensions of which vary considerably in the different subjects in whom it is observed. When the protrusion is caused by the upper part of the intestinal canal, the feces are voided at the extremity of the tumour, and, when the swelling consists of the lower portion of the bowel, the excrement is evacuated at the base of the prolapsed part.

When the tumour is double, it is easy to perceive, by observing this evacuation, to which end of the intestinal canal each protruded portion belongs. This consequence of an artificial anus is very serious, because it greatly increases the inconvenience, which the patient suffers. Sometimes, the tumour is exquisitely sensible; and, occasionally, when the eversion of the intestine is considerable, a strangulation is produced, which puts the patient's life in danger, unless such prompt assistance be afforded, as the nature of the case demands.

The business of the surgeon is to prevent, if possible, the formation of an artificial anus, as we shall see elsewhere; but, when the event has occurred, and, particularly, when the whole or the greater part of the stools are discharged in this way, no attempt can be made to stop up the opening without exposing the patient's life to the most alarming danger. Even when a considerable quantity of the feces is discharged in the natural manner, it is always to be presumed, that the bowel is considerably contracted at the place, where it communicates with the wound, and that the intestine will be very apt to inflame, when an unusual ac-

cumulation of its contents has taken place, unless they have an opportunity of escaping through the external opening. Such an occurrence would make the patient likely to die in a very short time.

But, if it is dangerous to close an artificial anus, when the case is of the most simple description, the thing is absolutely impracticable, when the affliction is complicated with an everted prolapsus of a part of the bowel; although we read in the *Philosophical Transactions*, that M. Le Cat undertook such an operation, in a case, in which there was an eversion of each portion of the intestinal canal.

But the pain which he gave the patient in endeavouring to reduce the protruded intestine, induced him to abandon all further attempts. If, also, in such a case, it were easy to reduce the displaced portions of intestine, and if that, which is connected with the rectum, were nearly of its natural diameter, (a circumstance not to be expected,) prudence would not allow us to place these portions opposite each other, for the sake of re-establishing the continuity of the canal. The number and depth of the adhesions, which the intestines may have contracted with each other, and the neighbouring parts, are likely to render such an operation impracticable. It would also be terrible to make an unsuccessful attempt of this kind, and to plunge into imminent peril, a person in other respects quite well, and who, with the exception of some inconvenience, may enjoy life as well as subjects of the best constitutions.

Though we cannot remedy such eversions of the intestine, as are brought on by an artificial anus, when the tumour is rather large, and of long standing; yet, there is a possibility of affording relief, when the swelling is small and recent. In this circumstance, skilful treatment would probably prevent the progress of the disorder, and even effect an entire cure. The treatment must obviously be very similar to that of the prolapsus ani, for both complaints are of the same nature. The practitioner should endeavour gently to return the tumour into the abdomen, and to retain it there by means of a soft pad of suitable size. This pad should be changed very frequently, on account of the matter discharged from the opening. As posture must greatly tend to bring about a cure, the patient should be recommended to lie down, as much as possible, on the side opposite the disease. He should be enjoined to make no violent exertion, which would put the abdominal muscles and diaphragm into action, and force the intestines through the external opening. If there be any

difficulty in evacuating the feces from the artificial anus, the belly should be kept gently open. The parts in the vicinity of the artificial anus should be strengthened by slightly astringent fomentations, &c. It might also be very useful to support the margin of the opening by an ivory or elastic-gum compress, if the patient should void feces of a thick consistence, and should feel, before the evacuation, the kind of inclination which precedes the discharge of the feces in the natural way.

Thus by advice, which is both simple and easy to follow, a grievous affliction may be prevented; and one which would expose the patient to the most pressing danger, were the swelling, to which the intestines protruded from an artificial anus are subject, to acquire such a size, that the bowels themselves become strangulated in the opening, through which they pass. (*Encyclopédie Méthodique; Partie Chirurgicale. Art. Anus contre Nature.*)

Mr. Lawrence has made a few very accurate remarks on the present subject, and he has also related some particulars of a case of artificial anus, which convey considerable instruction.

"If the complaint (a mortified hernia) terminates in the formation of an artificial anus, we must endeavour to alleviate those distressing inconveniences, which arise from the involuntary discharge of wind and feces through the new opening, by supplying the patient with an apparatus, in which these may be received, as they pass off. An instrument of this kind, the construction of which appears very perfect, is described by Richter (*Anfangsgr. der Wundarzn. Vol. 5.*) from the *Traité des Bandages* of Juville. The patient will be best enabled to adapt any contrivance of this sort to the particular circumstances of his own case. It has been found, in some instances, that a common elastic truss, with a compress of lint under the pad, has been more serviceable than any complicated instrument (*Parisian Journal, Vol. 1. p. 193.*) in preventing the continual flow of feculent matter from the artificial opening." (*Treatise on Hernia, p. 206. First edition.*)

"I know," says Mr. Lawrence, "a patient with an artificial anus, in whom the gut often protrudes to the length of eight or ten inches, at the same time bleeding from its surface. This is attended with pain, and compels him to lie down; in which position the intestine recedes. The patient has now discharged all his feces at the groin for fifteen years; and has enjoyed tolerable health and strength during that time. His evacuations are

generally fluid; but sometimes, of the natural consistence. Whenever he retains his urine, after feeling an inclination to void it, a quantity of clear inoffensive mucus, like the white of an egg, amounting to about four ounces, is expelled from the anus; and this may occur two or three times in the day." (*P. 208.*)

When the protruded intestine is strangulated, an operation may become necessary for the removal of the stricture. (*Schmucker Vermischte Chirurgische Schriften, Tom. 2.*) Two cases, which terminated fatally from this cause, are mentioned by Sabatier, in a memoir in the 5 Tom. de l'Acad. de Chir. Mr. Lawrence also refers to Le Blanc Précis d'Operations, de Chir. Tom. 2. p. 445. We should always endeavour to prevent such protrusions, when a disposition to their formation seems to exist, by the use of a steel truss, which should, indeed, be worn by the patient independently of this circumstance. If the tumour has become irreducible by the hand, an attempt may be made to replace it by keeping up a constant pressure on the part, the patient being at the same time confined to bed. By these means, Desault (*Parisian Journal, Vol. 1, p. 178.*) returned a very large prolapsus, and, by pressure on the opening, the feces were made to pass entirely by the anus, although, for four years, they had been voided only through the wound. (*Lawrence, p. 209, 210.*)

In cases of mortified hernia, the wound sometimes closes, except a small fistulous opening, which discharges a thin fluid, and cannot be healed. Mr. Lawrence has related, in his excellent treatise on hernia, a case, in which the feces came from the wound sometime after an operation, although the bowel did not appear gangrenous when this proceeding was adopted. (*P. 211.*)

In the appendix to this work, the author adds some further account of the case of artificial anus, which he has related (*P. 208.*) The man is sixty years of age, and appears to be healthy, active, and even younger, than he really is. He had had a scrotal hernia, which ended in mortification, and involved the testicle of the same side, and a large portion of the integuments, in the destruction. It is now nearly seventeen years since this event, and the feces have during all this time been discharged from the groin. He has never made use of a truss, nor taken any step, except that of always keeping a quantity of tow in his breeches.

The prolapsed portion of intestine varies in length and size at different times. It was four inches long when Mr. Law-

rence saw it, and the basis, which is the largest part, measured nearly six inches in circumference. The prolapsus never recedes entirely, and it has occasionally protruded to the length of eight or ten inches, being as large as the forearm, and emitting blood. This occurrence is painful, and only comes on when the bowels are out of order. Warm fomentations, and a recumbent position, afford relief, and accomplish a reduction of the bowel.

The projecting part is of an uniform red colour, similar to that of florid and healthy granulations. The surface, although wrinkled and irregular, is smooth, and lubricated by a mucus secretion. It feels firm and fleshy, and can be squeezed and handled, without exciting pain. The man has not the least power of retaining his stools. When these are fluid, they come away repeatedly in the course of the day, and with considerable force. When of a firmer consistence, there is only one stool, every one or two days, and the evacuation requires much straining. Such feces are not broader than the little finger. When the patient is purged, the food is often voided very little changed. This is particularly the case with cucumber. In this state he is always very weak. He is sometimes discharged five minutes after taken, being scarcely at all altered. The bowels are strongly affected by slight doses of purgatives. (*Lawrence, in Treatise on Hernia.*)

Consult *Sabatier in Mém. de l'Acad. de Chirurgie, Tom. 5, 4to. and in Médecine Opératoire, Tom. 2. L'Encyclopédie Méthodique, Partie Chirurg. Richter's Anfangsgr. der Wundarzn. Band 5. Parisian Chirurgial Journal. Œuvres Chirurg. de Desault par Bichat, Tom. 2. Schmucker's Chirurgische Schriften, Vol. 2. Lawrence's Treatise on Hernia.*

AORTA. Aneurisms of this vessel have already been treated of; but, there are a few other particulars, relating to this important artery, which seem to merit notice in a dictionary of surgery, and can only be conveniently mentioned in the present place.

WOUND OF THE AORTA NOT ALWAYS FOLLOWED BY INSTANTANEOUS DEATH.

A case, exemplifying the fact, has been lately recorded by M. Pelletan. In the month of May, 1802, a young military man, of middling strength, applied at the Hôtel-Dieu. In a duel, he had been run through with a foil, which penetrated above the right nipple, and came out at the left loin. The most alarming symptoms were apprehended; but, several days elapsed without any serious

complaints taking place. The patient was bled twice, and kept on a very low regimen. Every thing went on quietly for a fortnight. He now complained of severe pains in his loins, and he was relieved by the warm bath. He seemed to be recovering, got up and went to walk in the garden allotted for the sick; but, the pain in his loins quickly returned, attended with a difficulty of breathing, constipation, and wakefulness. He became very impatient and out of temper with the surgeons for not relieving him.

On the 15th of July, two months after the accident, a deformity of the spine was remarked about the eighth dorsal vertebra. The patient grew rapidly worse, and died in the utmost agony, saying that he felt suffocated, and tearing off his shirt that his chest might be free from the pressure of all kinds of clothing.

On the body being opened, the right side of the chest was found full of blood, coagulated in various degrees, and an opening, the diameter of which was equal to that of a writing pen, was detected in the aorta above the crura of the diaphragm. All the adjacent cellular substance was injected with blood, and three of the dorsal vertebræ were found carious. No mark of injury was perceptible in any of the thoracic or abdominal viscera. (See *Pelletan's Clinique Chirurgicale, Tom. 1, p. 92—94.*)

THICKENING AND CONSTRICTION OF THE AORTA.

Meckel met with two cases, in which the aorta was thickened and considerably constricted, just below its arch; yet, in both subjects, there was every reason to believe, that the abdominal viscera and lower extremities had been duly supplied with blood.

This fluid, which could only pass from the heart with great difficulty, and in small quantities, had, by regurgitating, lacerated the semilunar valves. (*Mém. de l'Acad. Royal. de Berlin, 1756. Obs. 17 and 18.*) A like example is recorded by Stoerk. (*Ann. Med. 11. p. 171.*)

OBLITERATION OF THE CAVITY OF THE AORTA.

It is observed by Professor Scarpa, that the whole body may be regarded as an anastomosis of vessels, a vascular circle, and he contends, that this remark is so true, that even an obliteration of the aorta itself, immediately below its arch, may take place, without the general circulation of the blood in the body being stop-

ped. Such a disease of the aorta was seen by M. Paris in the body of a woman. While she lived, the blood, which was expelled from the heart, was transmitted into the trunk of the aorta, below the constriction, and it got there by passing through the subclavian, axillary, and cervical arteries, into the mammary, intercostal, diaphragmatic, and epigastric arteries. From these latter arteries, the blood passed into the vessels of the thoracic and abdominal viscera, and those of the lower extremities. (See *Desault's Journal*, Tom. 2, p. 107.)

The very remarkable fact, that the circulation may be continued, even though the aorta is entirely obstructed, ought to make us considerably more confident in the success of operations, in which we are obliged to tie such arteries as the subclavian, and external iliac.

RUPTURE OF THE AORTA WITHIN THE PERICARDIUM.

The surgical writings of Scarpa, in relation to the formation of aneurisms, have now gained extensive celebrity in the world. It is well known, that this author maintains the doctrine, that, in all aneurisms, the internal and muscular coats of the artery are ruptured, and that the aneurismal sac is not formed of these tunics, but of the dilated cellular sheath, which surrounds the vessel. When a large aneurism bursts, there is always a double rupture; one of the artery; another of the aneurismal sac. The last is that, which is the immediate cause of the patient's destruction, by altering the *circumscribed* state of the aneurism into the *diffused*.

There are some exceptions, however, to the foregoing statement, and Scarpa has not failed to point them out. When the internal and muscular coats of the aorta are ruptured in a situation, where the outside of the vessel is only covered by a thin, tense, closely adherent membrane, such membrane may be ruptured at the same time with the proper coats of the artery, and sudden death be occasioned by the effusion of blood in the cavity of the thorax. These events are liable to happen, whenever the proper coats of the aorta are ruptured, within the pericardium, where the vessel is only covered by a thin layer reflected from this membranous bag. Walter has recorded one example of this kind, and Morgagni several others. A similar case is related by Scarpa. (See *Haller Disput. Chir. Tom. 5. Acta Medic. Berlin. Vol. 8. p. 86. Morgagni de Sed. et Causis Morb. Epist. 26. art. 7. 17. 21. Epist. 27.*

Art. 23. Scarpa on Aneurism, trans. by Wishart. p. 81.)

STEATOMATOUS TUMOURS OF THE AORTA.

Two steatomatous tumours were noticed by Stenzel in the body of a male subject. They were situated in the substance of the membranes of the aorta, immediately below its arch. Notwithstanding these swellings rendered the vessel almost impervious, the man had the appearance of strength, and of having been well nourished. *Hæc corpora fere cor magnitudine æquabant ut omnem propemodum exeunti e sinistri cordis thalamo sanguini spatium præcluderent.* Dissert. de Steatomatibus Aortæ.

This is another striking fact illustrating the great power of the inosculations to carry on the circulation.

APHÆRESIS, (from ἀφαίρεω, to remove.) This term was formerly much used in the schools of surgery, to signify that part of the art, which consists in taking off any diseased, or preternatural, portion of the body.

APONEUROSIS. (απο, from, and νευρον, a nerve.) The expression νευρον was applied by Hippocrates and other ancient writers to tendons and ligaments as well as nerves, all which parts seemed to resemble each other in having a white fibrous texture.

Matter very often collects under aponeuroses in different situations of the body, particularly, under the tendinous expansions, which cover the muscles of the thigh, the leg, and the forearm. Abscesses are also sometimes met with under the temporal, the palmar, and the plantar fasciæ; in the tendinous thecæ, which include the flexor tendons of the fingers; and, occasionally, also, in the aponeurotic sheath, in which the rectus abdominis muscle is situated.

One particular effect of an aponeurosis, or any kind of tendinous expansion, lying between a collection of matter and the skin, is materially to retard the progress of the pus towards the surface of the body. Hence, if the case be allowed to take its own course, the quantity of matter increases, the pus spreads extensively under the aponeurosis in every possible direction, separates the muscles from such fascia, and the muscles from each other, and the abscess does not burst till a vast deal of mischief has been produced, together with more or less sloughing of the fascia, tendons, &c. Such circumstances cannot happen, without a considerable degree of constitutional disturbance, and a permanent loss of the use of certain muscles

Even when a spontaneous opening is formed, and some of the matter escapes, it is often only a very imperfect discharge; for, the aperture generally occurs, not in a depending situation, nor over the main collection of pus, but, at a part, where the aponeurosis is most thin, and, consequently, where the matter had the least resistance to overcome in getting to the surface of the body.

The grand indication, in all such cases, is to make an early and a depending opening with a lancet, so as to prevent the extension of concealed mischief, and to let the matter escape as fast as it is formed. If a spontaneous opening should have occurred in an unfavourable place, a new aperture must be made in a proper situation; or if the former should be sufficiently depending and near the principal accumulation of matter, but too small, it must be rendered larger with a curved bistoury and a director. In every instance in which an opening has been made, or enlarged, with a cutting instrument, it will be necessary to keep some lint between the lips of the incision, for the first few days, in order to prevent the part from healing up by the first intention. The lint must be occasionally taken out for the purpose of letting the matter flow out, and a fresh bit be afterwards introduced. Whenever any black dead pieces of fascia, or tendons, present themselves at the opening, they must be taken hold of with a pair of forceps and extracted.

APOSTEMA. (from *απισημα*, to recede.) An abscess.

APPARATUS. This implies the preparation, and arrangement of every thing necessary in the performance of an operation, or in the application of dressings. The apparatus varies according to circumstances. Instruments, machines, bandages, tapes, compresses, pledgets, dossils of lint, tents, &c. are parts of the apparatus, as well as any medicinal substance used.

It is a rule in surgery, to have the apparatus ready before beginning an operation. All preparations of this kind should not be made in the patient's room when the thing can be avoided, nor any where in his presence, as it would agitate him, and render him timid, and more restless in the operation.

APPARATUS MINOR; APPARATUS MAJOR; APPARATUS ALTUS. Three ways of cutting for the stone. (See *Lithotomy*.)

AQUA AMMONIÆ ACETATÆ. This is given in the dose of half an ounce in many surgical cases, in which the object is to keep up a gentle perspiration.

AQUA ARSENICATA,

VOL. I.

& Arsenici in pulverem triti unc. ss.

Aqæ distillatæ lib. j.

These are to be boiled together in a flask till one fourth of the liquor is evaporated, and, when cold, filter the remainder through paper by means of a glass funnel. Has been applied to foul ulcers and cancers.

AQUA CALCIS. (LIQUOR CALCIS, L. P.)

This is sometimes used as an astrigent injection, or lotion, in cases of gonorrhœa, gleet, psora, tinea capitis, abscesses, &c.

AQUA CUPRI VITRIOLATI CAMPHORATA.

& Cupri vitriolati.

Boli Gallici sing. unc. ss.

Camphoræ drach. j.

Aqæ ferventis lib. iv.

Boiling water is to be added to the other ingredients, and the liquor filtered when cold. Is chiefly employed in a diluted state, as a collyrium; but it may also prove of service as an application to foul ulcers.

When used for the cure of the purulent ophthalmia, the lotion is to be injected under the eyelids by means of a blunt syringe, and, if necessary, the application may be repeated once or twice every hour. Some further particulars will be offered in the article *Ophthalmia*.

AQUA KALI. (LIQUOR POTASSÆ SUBCARBONATIS, L. P.) No adequate trial of this as an external application to ulcers or herpetic eruptions has yet been made; but, in the dose of 40 drops night and morning, Mr. Hunter thinks it cures some sores, resembling mild chancres, which were unaltered by the internal use of mercury and irritated by its use as a topic.

This remedy is principally deserving of notice on account of its having been given with a view of dissolving calculi in the bladder, so as to remove the necessity of performing the dangerous and painful operation of lithotomy. The principle, on which the aqua kali acts is by the alkali attracting and combining with the uric acid of the calculus. The medicine may be exhibited in doses of 20, or 40 drops, or of a dram, in a basin of gruel. Experience does not seem to justify the indulgence of much hope, with regard to the complete efficacy of the aqua kali in dissolving urinary calcula; but, there is no doubt, that it has often materially palliated the pain, which attends the presence of a stone in the bladder.

Some practitioners place more confidence in the aqua kali puri.

AQUA KALI ARSENICATI.

& Kali Arsenicati grana duos.

Aqæ Menthæ Sativæ uncias quatuor
Spiritus Vinosi tenuioris unciam.

Misce et cola.

Two drams of this may be given thrice

a day in cases of cancer. Mr. Barnes once shewed me a case of herpes of the nose, or *noli me tangere*, which was greatly benefited by this remedy externally applied. The patient was under Mr. Harvey, in St. Bartholomew's Hospital, and, at the time when I saw her, Mr. Barnes was using the lotion with double the proportion of arsenic. There are many ulcerations round the roots of the nails of the fingers and toes, to which many apply Plunket's caustic; but, the *aquæ kali arsenicati* would, in all probability, be quite as efficacious an application, and, certainly, it is a nearer one.

AQUA KALI PURI. (*Liquor Potassæ*, L. P.) This has been given with a view of dissolving urinary calculi, in considerable doses, for a length of time. The trials, however, have not proved so successful as could have been wished, nor is the exhibition of so active a remedy unattended with disadvantageous consequences to the system; for which reason, under the name of *mephitic alkaline water*, vegetable alkali supersaturated with fixed air, has of late been much substituted.

The proper dose, at first, is from ten to twenty drops, twice a day, in some linseed tea. At Saint Thomas's Hospital, the following is the way, in which the *aqua kali puri* is prescribed:

℞ *Aquæ Kali puri* ℥i.

Aquæ Distillatæ ℥ij. *Misce.* *Dosis* Drachma una bis die ex uncis quatuor infusi lini.

AQUA LITHARGYRI ACETATI. (*Liquor Plumbi Acetatis*, L. P.) Is extensively used largely diluted with water, as an application to inflamed parts. One dram to a quart of water is quite strong enough for common purposes. Mr. Justamond and Dr. Cheston used to apply it mixed with an equal proportion of a spirit resembling the *tinctura ferri muriati*, to the edges of cancerous sores.

The fear of the absorption of lead, has induced many practitioners to give up the use of this remedy, and have recourse to solutions of vitriolated zinc, which, it is said, answer equally well; but it is now rendered probable, from the experiments of Mr. Baynton, of Bristol, that cold water alone is of as much service as either in removing inflammation. (See *Pharmacopœia Chirurgica*.)

AQUA PICIS. May be applied to *tinea capitis*. There are ulcers on the legs, surrounded with a scorbutic redness, and pimples, covering a large extent of the skin. In such instances, the *aqua picis*, used as an application round the limb, over the dressings, is of great service.

AQUEOUS HUMOUR OF THE EYE. The proposal of letting out this

fluid, and the circumstances, in which such an operation may be proper, will be considered in the article *Ophthalmy*.

ARDOR URINÆ. Difficulty and pain in making water, attended with a sense of heat in the urethra, a symptom of gonorrhea, and some other affections.

ARGEMA, or **ARGEMON.** (from *αργος* white.) A small white ulcer of the globe of the eye. (See *Cornea, ulcers of*.)

ARGENTI NITRAS. (*Nitrate of silver, lunar caustic.*) Is the best of the mildest caustics. Its utility for stimulating indolent ulcers, and keeping granulations from rising too high, is known to every one.

Mr. Hunter recommends the use of the *argentum nitratum*, on the first appearance of a chancre, before absorption can be supposed to have taken place. He directs the caustic to be scraped to a point, like a blacklead pencil; so that, when it is applied, every part of the surface of the chancre may come into contact with it; and he advises the repetition of this process, till the last slough, which is thrown off, leaves the sore florid and healthy, (*Hunter on the Venereal*.)

From this treatment, there is a chance, that the constitution will not be infected; but it is generally prudent, notwithstanding, to give the *pil. hydrargyri*.

The important use of the *argentum nitratum*, in the cure of numerous diseases, we shall have occasion to remark in various places of this work; particularly when we come to the article *Urethra, strictures of*, in the removal of which disease it is peculiarly useful.

The *argentum nitratum* is often used in the form of a solution, in the proportion of a dram of the caustic to an ounce of distilled water. In general this application ought to be at first more or less weakened, by the addition of a quantity of distilled water. Cancerous ulcers, and sores about the nose and neighbouring parts of the face, commonly going under the denomination of *noli me tangere* are often considerably benefited by the *argentum nitratum*, both in the solid and fluid state. The solution agrees very well with certain sores, which occur round the roots of the nails of the fingers and toes. The lotion is sometimes applied with a camel-hair-pencil; in general, however, by dipping little soft bits of lint in the fluid, laying them on the part, and covering them with a pledget.

ARNICA. (*αρνικη*, from *αἶς*, a lamb.) *Leopardsbane*.

Amaurosis is the principal case in which surgeons now ever employ this medicine. From a dram to half an ounce of the flowers may be infused in a pint of water, and

this may be taken in the course of four and twenty hours. Arnica, thus exhibited, sometimes produces vomiting, profuse perspiration, and an increased secretion from the kidneys. At other times, no evident effects of this sort arise. The virtues of this medicine have undoubtedly been exaggerated, though no one can question that, as it is a powerful one, the trial of it should still be continued.

ARSENIC. (from the Arabic *Arsenek*, or *arsen*, *masculus*, from the strength of its qualities.) Every one is acquainted with the deleterious effects of this mineral, which, in the dose of a few grains, acts as the most violent poison. Notwithstanding such effects which are generally dreaded, practitioners have ventured to employ arsenic as a remedy for diseases, and this has sometimes been done with success, not only as an external topical application, but, even as an internal medicine.

Arsenic is the principal ingredient of a secret remedy, which, in Ireland, has long possessed very great celebrity for the cure of cancer, and which is known by the name of Plunket's caustic. This application is said to consist of the ranunculus acris, the greater crow-foot, the flammula vulgaris, and the lesser crow-foot: an ounce of each is to be bruised, and added to a dram of arsenic, and five scruples of sulphur. The whole is to be beaten into a paste, formed into balls, and dried in the sun. When used, they are to be beaten up with the yolk of an egg, and applied on a piece of pig's bladder. The use of the ranunculus is to destroy the cuticle, on which the arsenic does not act. The application is to remain on twenty-four hours, and the slough is to be afterwards dressed with any simple, unirritating ointment. Arsenic seems to have been first recommended as an external application to cancers, and it was generally combined with opium. It certainly sometimes produces a salutary change in the appearance of the sore. We have reason to regret, that this change is usually not of permanent continuance. Besides Plunket's remedy, various other preparations of arsenic have been externally employed.

Mr. Justamond's applications to cancer, originally suggested by a receipt, said to be preserved in the Earl of Arundel's family, were somewhat varied. They were generally combinations of arsenic and sulphur. The above receipt directs an ounce of yellow arsenic, with half that quantity of armenian bole, and sometimes as much red precipitate. Mr. Justamond also employed a sulphuret of arsenic, and a combination of this sulphuret with crude antimony. The arsenical preparation, pre-

ferred, was scraped and laid on the middle of the sore, while its edges were moistened with a combination of muriated iron, and sal ammoniac. The effects were, the correction of the fetid smell, melioration of the appearance of the sore, and separation of the cancerous part.

In the Pharmacopœia Chirurgica, Mr. Justamond's arsenical caustic is directed to be made in the following manner: \mathfrak{z} antimonii pulverizati \mathfrak{z} ij. arsenici pulverizati \mathfrak{z} ij. These are to be melted together in a crucible. The application may be reduced to any degree of mildness by the addition of powdered opium. The latter ingredient may also act specifically in diminishing the pain. M. Febure's remedy consisted of ten grains of arsenic, dissolved in a pint of water, with an ounce of the extract of cicuta, three ounces of Goulard's extract, and a dram of laudanum. With this fluid the cancer was washed every morning. He gave also arsenic internally, and directs two grains to be dissolved in a pint of water, to which must be added syrup of chicory, with half an ounce of rhubarb. A tablespoonful is to be given night and morning, with half a dram of the syrup of poppies. It may be remarked, that the dose of the arsenic, in this preparation, is one twelfth of a grain.

The kali arsenicatum is an excellent preparation for internal exhibition, and is thus made:

\mathfrak{z} Arsenici Albi, Nitri Purificati, singulorum unciam:

Crucibulo amplo igne candenti injice nitrum, et liquefacto adde gradatim arsenicum in frustulis, donec vapores nitrosi oriri cessaverint. Solve materiam, in aquæ distillatæ libris quatuor et post idoneam evaporationem seponere, ut fiant crystalli.

Dosis, Grani pars decima ter quotidie.

It may be given in the following way.

\mathfrak{z} Kali arsenicati gr. ij.

Aq. Menthæ Sativæ \mathfrak{z} iv.

Spirit. Vinosi tenuioris \mathfrak{z} ij. M. et. cola.

Dosis drachmæ duæ ter quotidie.

The following is Dr. Fowler's method of preparing arsenic for internal use. Take of powdered arsenic, and prepared kali, each sixty-four grains; boil them gently in a Florentine flask, or other glass vessel, with half a pound of distilled water, until the arsenic is dissolved. To this solution, when cold, add half an ounce of the compound spirit of lavender, and as much water as will make the whole equal to a pint, or fifteen ounces and a half in weight. The dose of this solution is as follows: From two years old to four, gutt. ij or iij to v; from five to seven, gutt. v

to vij; from eight to twelve, gutt. vij to x; from thirteen to eighteen, gutt. x to xii; from eighteen upwards, gutt. xij.

These doses may be repeated once in eight or twelve hours, diluted with thick gruel or barley-water.

It will only be in my power to specify here a few of the numerous surgical cases, in which the internal employment of arsenic has been proposed. The following are particularly worthy of attention: tetanic affections; cancer: noli me tangere; elephantiasis; numerous unnamed malignant ulcers; several obstinate cutaneous diseases; pseudo-syphilis, and those sequela of the venereal disease, which cannot be subdued by mercury, &c.

Arsenic has also been recommended for the prevention of hydrophobia by Dr. J. Hunter. (See *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol. 1*) Subsequent trials of this medicine, however, in such cases, do not seem to entitle it to much confidence. After the symptoms have begun, arsenic decidedly has no power in arresting the disease. It was lately tried by Dr. Marcet. Three drops of Fowler's solution were ordered to be taken, every other hour, in two drams of peppermint or water, with half a dram of syrup. However, no relief whatever seemed to be derived from the medicine. (See *Medico-Chirurgical Transactions, Vol. I. p. 141—156.*)

But, although arsenic has hitherto failed in producing benefit in cases of hydrophobia, some facts have been recently published by Mr. Ireland, surgeon to the 4th Battalion of the 60th Regiment, which make it appear a truly valuable and efficacious remedy for counteracting the poison of serpents. (See *Medico-Chirurgical Transactions, Vol. II. p. 393, and the article, Wounds—Bite of the Viper, in this Dictionary*)

Surgeons are frequently desired to examine the bodies of persons, suspected of having been poisoned with arsenic, and every practitioner should qualify himself to judge whether the suspicion is rightly formed, or not. Often, indeed, the life of the person, supposed to have administered the poison, will entirely depend upon the nature of the medical evidence. Besides, in certain cases, the symptoms, which precede a natural death, are of such a description, as to create strong suspicions that the patient has died of poison, when the fact is otherwise. Hence, it must be plain, that, both with respect to the question of murder, and of suicide, the evidence of the surgeon will frequently be of the utmost importance.

The symptoms and effects of arsenic,

when taken into the stomach, ought to be well remembered. A pricking and burning sensation will soon be experienced in this organ. Sudden and excruciating pains will be felt in the bowels. A severe vomiting will arise. The tongue, mouth, and throat, will become rough, and parched, and an unquenchable thirst will prevail, with much anxiety and restlessness. When the dose of arsenic has been considerable, and proper antidotes have not been employed in time, an inflammation of the stomach and intestines will be the consequence, and it sometimes terminates in gangrene. Distention of the abdomen, coldness of the extremities, slow feeble pulse, fetid vomiting and stools, hiccough, and, lastly, death, ensue. In one instance of death from arsenic, related by Dr. Yelloly, not the least mark of pain, or tenderness, in the abdomen, was perceptible while the patient lived. (See *Edinb. Med. and Surgical Journal, Vol. 5. p. 391.*)

When the body of a person, who has been poisoned with arsenic, is opened, the small intestines will generally be found to be inflamed and thickened, their external surface being in some places of a florid red colour, and in others, of a purple hue; while here and there effusions of coagulating lymph may be observed. The large intestines in general seem to suffer less, though, in some cases, they are found more or less inflamed as far as the extremity of the rectum. Sometimes, the bowels are even quite mortified in various places.

The villous coat of the stomach is considerably inflamed, and points of extravasated blood may commonly be noticed upon it. In one case, examined by Dr. Yelloly, there were observed two, or three circular spots, of the size of a shilling, which were abrasions of the membrane. In some places, the villous coat seemed to be thickened by an effusion of lymph.

The convolutions of the intestines will often be found connected together by adhesions. The lining of the œsophagus will also sometimes partake of the inflammation.

Very violent and even fatal effects may also arise from the absorption of arsenic from the skin into the circulation. (See *Med. and Physical Journal, Vol. 5. p. 543.*)

There are five methods of detecting the presence of arsenic. First, by precipitating this mineral from any fluid, in which it is dissolved, by an alkaline hydro-sulphuret. Secondly, by precipitating any solution of arsenic by the sulphate of copper. Thirdly, by reducing the oxide into the metallic state, by heating it with extraneous substances in a glass-tube. Fourthly, by observing the effect, which

arsenic has, in whitening copper, when heated in contact with it. Fifthly, by perceiving the peculiar odour, which is exhaled, when arsenic is evaporated from a heated surface.

When some of the solution of sulphuret of potash (kali sulphuratum) is added to a solution of the white oxide of arsenic, a precipitate is instantly formed of a bright orange colour.

All surgeons, however, should be aware, that a very similar effect is produced by adding the solution of kali sulphuratum to a solution of tartarised antimony; but, the precipitate is not formed so readily as when arsenic is concerned.

The second means of ascertaining the presence of arsenic is by precipitating a mixed solution of the white oxide of this metal and potash, by adding some of the solution of the sulphate of copper, (*Cuprum vitriolatum*.) The precipitate, formed by this process, is of a beautiful green colour, and is well known by the name of Scheele's green paint. In order to produce such precipitate in the best way, Dr. Bostock recommends, that the proportions of the oxide of arsenic, potash, and sulphate of copper, be to each other, as one, three, and five. (*Edinb. Med. and Surgical Journal*, Vol. 5, p. 169.)

The third method of detecting arsenic consists in reducing the oxide into the metallic state, by mixing the suspected powder with a little charcoal, putting these substances into a glass tube, and exposing them for a full quarter of an hour to a red heat. One end of the tube should be hermetically closed, the other stopped with a plug of clay. The glass must also be every where well coated with clay and sand, be about a quarter of an inch in diameter, and eight inches in length. On the application of caloric, the oxygen of the arsenic unites with the carbon, and forms carbonic acid gas, leaving the arsenic on the inside of the glass tube reduced to the metallic state. This is reckoned the most decisive test of the presence of arsenic; but, it will not answer when the quantity of the latter mineral is less than a grain.

The quality, which arsenic has, of uniting with copper and forming a white compound, is the fourth means of detecting the presence of the first of these metals. For this purpose, put one grain of suspected powder, with half a grain of powdered charcoal, and two drops of oil, between two plates of polished copper, which are to be bound together with some wire, and exposed, for some time, to a red heat.

Dr. Bostock has explained, that, when a paste of charcoal and oil alone is put

between plates of copper, and exposed to heat, a somewhat similar white appearance is produced on them, so that the communication of a white colour to copper by arsenic is not the most eligible criterion, particularly, when the quantity of the suspected substance is small.

The fifth mode of judging of the presence of arsenic is by the low, bluish, white, flame, alliaceous smell, and white smoke, which arise when that mineral is thrown on a red hot body. This experiment will only afford information, to be depended upon, when the quantity of arsenic is considerable, and it is unmixed with other substances.

Of all the foregoing modes, Dr. Bostock deems that, in which the green precipitate is produced with the sulphate of copper, the most convenient, delicate, and decisive.

Of late, a new test of arsenic has been suggested. The following is the account given of it by Dr. P. M. Roget: "Let the fluid, suspected to contain arsenic, be filtered: let the end of a glass rod, wetted with a solution of pure ammonia, be brought into contact with this fluid; and let a clean rod, similarly wetted with a solution of nitrate of silver, be brought into contact with the mixture. If the minutest quantity of arsenic be present, a precipitate of a bright yellow colour, inclining to orange, will appear at the point of contact, and will readily subside to the bottom of the vessel.— (Note. As this precipitate is soluble in ammonia, particular care should be taken to avoid adding it in excess; indeed, the quantity of either ammonia or nitrate of silver employed, can scarcely be too small for the purpose of detecting the presence of arsenic.)

"In examining the circumstances, attending the agency of this test, the following particulars were observed. On adding successively ammonia and nitrate of silver to distilled water, no precipitation takes place. Fowler's arsenical solution affords a precipitate of a yellow colour, similar in appearance to that produced by a solution of the white oxyd; but, a solution of arsenic acid gives a precipitate of a red brick colour. The fixed alkalies, when substituted for ammonia, likewise produce a yellow precipitate; but, the results are less distinct, since, in the circumstances, in which the experiment is made, they decompose the nitrate of silver, an effect, which ammonia does not produce. We found, by comparative experiments, that the precipitates, thrown down by the same reagents, (namely, ammonia and nitrate of silver,) when either zinc, iron, copper, mercury, or lead was contained

in the fluid, had an appearance totally different from that produced by arsenic; and that the latter could readily be detected by the same means, notwithstanding the presence of these metals. The salts of copper, or lead, when previously mixed with a solution containing arsenic, occasioned no difference in the results. With a solution of oxymuriate of mercury, ammonia alone will occasion a white precipitate; but, if arsenic be also present, on addition of nitrate of silver the precipitate immediately acquires a yellow colour. The efficacy of this compound test is not weakened, but, on the contrary, seems to be rather increased by the presence of sulphate of iron. Sulphate of zinc was not found to interfere with its operation, any otherwise than requiring a larger quantity of ammonia, in order to saturate the sulphuric acid; but, when this has been effected, and the whole of the zinc precipitated, the addition of nitrate of silver produces the same yellow tint as in the other experiments. There is, therefore, reason to presume, that no admixture of metallic, or other salts, will occasion ambiguity, or enable the arsenic to escape detection, when the above test is properly applied. (Dr. Roget observes, in a note, that in the *Philosophical Magazine*, for 1809, Mr. Hume has proposed boiling the suspected matter with a solution of carbonate of potash, and bringing into contact with it a stick of dry nitrate of silver: a method, somewhat analogous to that above described, but, much less convenient in its practical application.)

"Being curious to determine the limit of minuteness in the quantity of arsenic, discoverable by this test, we dissolved a grain of white arsenic in a known quantity of distilled water, and, by successive additions of water to determinate portions of this solution, prepared other solutions, containing respectively one 2000th, one 20,000th, and one 200,000th of their weight of arsenic. By applying the test to a small quantity in a watch-glass, we found, that, when it contained only one 25,000th of a grain of arsenic, the precipitate was of a bright yellow colour. It was still distinctly yellow, when the quantity of arsenic was reduced by dilution to one 50,000th of a grain. When further diluted, the yellowness was gradually less and less discernible, and the precipitate appeared of a light blue. It retained this colour, until its quantity became too minute for observation. A bluish cloud, however, was very distinctly visible, when the fluid examined contained only the 250,000th part of a grain of arsenic.

"If, (says Dr. Roget) along with the extraordinary degree of delicacy of this

test, we take into consideration the extreme facility of applying it, and the greater convenience of operating upon fluids, than upon solid bodies, as we are obliged to do, when we have recourse to the usual methods, it appears decidedly entitled to preference." (See *Medico-Chirurgical Transactions*, Vol. 2, p. 156—160.)

The following plan should be pursued, when arsenic has been swallowed in such a quantity as to endanger life. An emetic of white or blue vitriol should be exhibited immediately, and large quantities of water swallowed, in which the liver of sulphur (kali sulphuratum) is dissolved. The stomach having been thus emptied, a mixture containing the kali sulphuratum, about a scruple to a dose, should be frequently exhibited, milk, butter, or castor oil, being freely given in the intervals.

The employment of copious blood-letting, in cases of poison from arsenic, was suggested by Dr. Yelloly, on the principle of removing inflammation. "Analogy (says he) seems to indicate its employment; but, its particular fitness can only be determined by experience." (*Edinburgh Medical and Surgical Journal*, Vol. 5, p. 393.) Dr. Roget has put this proposal to the test of experiment, and the recovery, which was effected by that gentleman, after a large quantity of arsenic had been swallowed, and most alarming symptoms had come on, seems to be much in confirmation of the utility of the practice. (See *Medico-Chirurgical Transactions*, Vol. 2, p. 136.)

This article would admit of being considerably lengthened; but, as some of the subject is as much medical as surgical, I think it will be sufficient in this work to refer the reader to sources, from which more extensive information may be obtained. (See *Observations on the different Methods recommended for detecting minute Portions of Arsenic*, by John Bostock, M. D. *Edinb. Med and Surgical Journal*, Vol. 5, p. 166, also p. 14. *Dissertatio Inauguralis de Effectibus Arsenici in varios organismos necnon de indicis quibusdam veneficii ab Arsenico illati; quam præsiede C. F. Kiemayer publice defendet*, Jan. 1808. Auctor Georg. Fried. Jaeger, Stuttgartianus, 8vo. *Tubrisge. in Nouvelles Experiences sur les Contre-poisons de l'Arsenic*, par Casimir Renault, Paris an IX. *Murray's System of Chemistry*, Vol. 3, p. 356, Edit. 2. *Observations on the Use of Arsenic*, by G. N. Hill, in *Edinburgh Med. and Surgical Journal*, Vol. 5, p. 19—312. *Pharmacopœia Chirurgica. Medico-Chirurgical Transactions*, Vol. 1, p. 141, Vol. 2, p. 136, 156, and 393, &c.

ARTERIOTOMY. (from *αἵματις*, an

artery, and *τεμνω*, to cut.) The operation of opening an artery, for the purpose of taking away blood for the relief of diseases. (See *Bleeding*.)

ARTERIES, Wounded. (See *Hemorrhage*.)

ARTICULATIONS, Diseases of. (See *Joints*.)

ASTRINGENTS. (from *astringo*, to bind.) In medicine, are those substances which possess a power of making the living fibres become contracted, condensed, and corrugated. They are employed in the practice of surgery chiefly as external applications, either for restoring diminished tonic power, or checking various discharges. They are also deemed very eligible local remedies for phlegmonous inflammation.

ATHEROMA. (from *αθηρα*, pap.) An encysted tumour, so named from its pap-like contents. (See *Tumours Encysted*.)

AXILLARY ARTERY, Wounded.—When, in a case of this description, it is necessary to tie the injured vessel, Scarpa believes, that nothing tends more to embarrass the surgeon, than an injudicious smallness of the first incision through the skin and such other parts as conceal the wound in the artery. An assistant must

compress the vessel, from above the clavicle, as it passes over the first rib. When the weapon has penetrated, from below upward, directly into the axilla, the surgeon is to make a free dilatation of the wound upon a director, or his finger. This must be done to a sufficient height to expose a considerable portion of the artery, and the precise situation of the wound in it.

When the weapon has pierced obliquely, or from above downwards, through a portion of the great pectoral muscle, into the axilla, Scarpa advises the surgeon to cut through the lower edge of this muscle, and enlarge the wound, on a director, or his finger, so as to bring fairly into view the injured part of the artery. The thoracic arteries, divided in this operation, must be immediately tied. The clots of blood are then to be removed, and the bottom of the wound cleaned with a sponge, by which means the opening in the axillary artery will be more clearly seen. As this vessel lies imbedded in the brachial plexus of nerves, the surgeon must take care to raise it from these latter parts with a pair of forceps, before he ties it. Two ligatures will be required; one, above, the other below the wound of the artery.

B.

BALSAMUM COPAIVÆ. Exhibited by surgeons principally in cases of gonorrhœa, gleet, and piles. A dram may be given thrice a day.

BALSAMUM PERUVIANUM CUM FELLE BOVINO. *R.* Fellis Bovini ʒiij Balsami Peruv. ʒj M. Dr. H. Smith has advised this application to be occasionally dropped into the ear, when there is a fetid discharge from it. The meatus auditorius externus is also to be washed out every day, by syringing the passage with water, to which some recommend soap to be added.

BANDAGE. (*Deligatio Fasciæ*.) An apparatus, consisting of one or several pieces of linen, or flannel, and intended for covering, or surrounding parts of the body for surgical purposes.

The use of bandages is to keep such compresses, remedies, &c. in their proper situation, as are applied to any particular part; to compress blood-vessels, so as to restrain hemorrhage; to rectify certain deformities by holding the deranged parts

in a natural position; and to unite parts, in which there is a solution of continuity.

As the application of bandages is a very important branch of surgery, authors have not neglected it. Much has been written on the subject, and almost every writer has devised new bandages, perhaps without much benefit to surgery. Unfortunately, it is next to impossible to give very clear ideas of the numerous sorts of bandages by description. The surgeon can only acquire all the necessary instruction and information from the experience and habit resulting from practice. Hence, we shall confine ourselves to a general account of the subject.

Bandages should be made of such materials as possess sufficient strength to fulfil the end proposed in applying them, and they should, at the same time, be supple enough to become accommodated to the parts to which they are applied.

Bandages are made of linen, cotton, or flannel. If possible, they should be without a seam, and linen is woven for this

purpose; but the selvage is always harsh, and, as the edges are necessarily covered by the next round, they are sometimes inconvenient. Most surgeons prefer, therefore, old linen, and more readily submit to the inconvenience of the edges unravelling, than to the irregularity which any stitching would produce.

There are cases, in which the bandage should have a degree of firmness, that does not belong to the materials usually made use of. This circumstance is obvious in cases of hernia, and in all those in which there is occasion for elastic bandages. As we have already observed, linen, flannel, and cotton (calico), are the common materials. The first employment of flannel bandages is imputed to the Scotch surgeons, who preferred them to linen ones, in consequence of their being better calculated for absorbing moisture, while, being more elastic, they yield in a greater degree in cases requiring this property; as in the swelling subsequent to dislocations, fractures, &c. It has been asserted, that linen is better than flannel, because more cleanly; but neither one nor the other will continue clean, unless care be taken to change it very often.

The employment of cotton or calico bandages is a more recent method, and many advantages are attributed to the softness and elasticity of this material.

In applying a bandage, care must be taken, that it be put on tight enough to fulfil the object in view, without running any risk of stopping the circulation, or doing harm in any other way. If it be not sufficiently tight to support the parts in a proper manner, it is useless; if it be too tense, it will produce swelling, inflammation, and even mortification.

To apply a roller skilfully, the part which it is to cover, must be put in its proper situation; the head of the roller held in the surgeon's hand, and only so much unrolled as is requisite for covering the part.

In general the bandage should, if possible, be applied in such a manner as will admit of its being removed with the most ease, and allow the state of the parts beneath to be examined, as often as occasion requires.

For this reason, in fractures of the leg and thigh, the eighteen-tailed bandage is generally preferred to a simple roller. The former may be loosened and tightened, at pleasure, without occasioning the smallest disturbance of the affected limb; a thing which could not be done, were a common roller to be employed.

As soon as a bandage has fulfilled the object for which it is applied, and it has become useless, its employment should be

discontinued; for, by remaining too long on parts, it may obstruct the circulation, diminish the tone of the compressed fibres, and vessels, and thus do harm.

Bandages are either *simple* or *compound*. They are also sometimes divided into *general* and *particular*. The latter often derive their names from the parts, to which they are usually applied.

A simple bandage is a long piece of linen or cotton, of an indefinite length, and from three to six inches in breadth. When about to be applied, it is commonly rolled up, and the rolled part is termed its *head*. When rolled up from each end, it is called a *double-headed roller* or *bandage*.

The chief of the simple bandages are the *circular*, the *spiral*, the *uniting*, the *retaining*, the *expellent*, and the *creeping*.

The *circular* bandage is the simplest; the rolls cover each other, and it is seldom long, as two or three turns are generally enough.

The *spiral* bandage is the most frequently used of all; for, it is this which we see in such common employment on the limbs, in cases of ulcers, &c. In applying a common roller to the whole of a limb, the bandage must be carried round the part spirally, or else it is obvious that the whole member could never be covered. When the leg is the part, the surgeon is to begin by surrounding the foot with a few turns. Then carrying the head of the bandage over the instep, he is to convey it backward, so as to make the bandage unroll, and apply itself just above the heel. The roller may next be brought over the inner ankle; thence again over the instep, and under the sole; and the surgeon then brings the bandage spirally upward once more to the outer part of the leg. After this, every circle of the roller is to be applied, so as to ascend up the limb in a gradual, spiral form, and so as to cover about one third of the turn of the roller immediately below. The increasing and diminishing diameter of the limb, is one great cause, which brings into view the unskilfulness of a surgeon in this common operation; for, it prevents the roller from lying smoothly, although spirally applied, unless a particular artifice be dexterously adopted. The plan alluded to, is to double back the part of the roller that would not be even, were the application to be continued in the common spiral way, without this manœuvre. When the bulk of the limb increases very suddenly, it is sometimes necessary to fold, or, as it is termed, *reverse*, every circle of the bandage in the above manner, in order to make it lie evenly on the limb. It is mani-

fest, that the pressure of the roller will be greatest where the duplicatures are situated, and hence, when it is an object to compress any particular part, the surgeon should contrive to reverse the turns of the bandage just over the situation where most pressure is desirable.

When a roller is to be applied to the forearm, it is best to make the few first turns of the bandage round the hand.

Care must be taken not to make the bandage very tight, if it be intended to wet it afterwards with any lotion; for, it is always rendered still more tense by moisture.

Mr. John Bell describes the principal purposes for which a roller is employed, as follows: "Although in recent wounds, it is with plasters and sutures that we unite the parts point to point, yet it is with the bandage that we support the limb, preserve the parts in continual and perfect contact with each other, and prevent any strain upon the sutures, with which the parts are immediately joined, and we often unite parts by the bandage alone. (This is called the *Uniting Bandage*, and will be presently described.) But it is particularly to be observed, that in gun-shot wounds, and other bruised wounds, though it would be imprudent to sew the parts, since it is impossible that they should altogether unite, yet the gentle and general support which we give by a compress and bandage, prevents them from separating far from each other, unites the deep parts early, and lessens the extent of that surface, which must naturally fall into suppuration.

"In the hemorrhagy of wounds, we cannot always find the artery; we dare not always cut parts for fear of greater dangers; we are often alarmed with bleedings from uncertain vessels, &c. or from veins as well as arteries: these hemorrhages are to be suppressed by the compress; which compress, or even the sponge itself, is but an instrument of compression, serving to give the bandage its perfect effect. Frequently, in bleedings near the groin, or the arm-pit, or the angle of the jaw, wherever the bleeding is rapid, the vessels uncertain, the cavity deep, and the blood not to be commanded by a tourniquet, and where the circumstances forbid a deliberate and sure operation, we trust to compress and bandage alone.

"Bandage is very powerful in suppressing bleeding. At one period of surgery, it took place of every other method, &c. If a compress be neatly put upon the bleeding arteries, if there be a bone to resist the compress, or even if the soft parts be firm below, and the bandage be

well rolled, the patient is almost secure. But such a roller must be rolled smoothly from the very extremity of the fingers or toes; the member must be thoroughly supported in all its lower parts, that it may bear the pressure above. It is partial stricture alone that does harm, creates intolerable pain and anxiety, or brings on gangrene. Hemorrhagy requires a very powerful compression, which must therefore be very general, &c. It must not be made only over the bleeding arteries, which is all that the surgeon thinks of in general, &c.

"In abscesses, where matter is working downwards along the limb, seeking out, as it were, the weak parts, undermining the skin, and wasting it, insulating and surrounding the muscles, and penetrating to the bones, the bandage does every thing. The expelling bandage, the propelling bandage, the defensive bandage, were among the names, which the older surgeons gave to the roller, when it was applied for these particular purposes; and these are properties of the roller, which should not be forgotten." (*Principles of Surgery, Vol. 1.*)

Soon after this description of some of the chief surgical uses of the roller, Mr. John Bell proceeds to explain, in what manner this most simple of all bandages may be put on a limb.

"Practice will convince you, that the firmness and neatness of a bandage depend altogether upon these two points; first, upon the turns succeeding each other in a regular proportion; and, secondly, upon making reverses, wherever you find any slackness likely to arise from the varying form of the limb. Thus, in rolling from the foot to the ankle, leg, and knee, you must take care, first, that the turns, or, as the French call them, *doloires*, of the roller lie over one another by just one third of the breadth of the bandage; and, secondly, that at every difficult part, as over a joint, you turn the roller in your hand, make an angle, and lay the roller upon the limb, with the opposite flat side towards it; you must turn the bandage so as to reverse it, making, what the French call, a *renversée* of the roller at the ankle, at the calf of the leg, and at the knee. You must be careful to roll your bandage from below upwards, and support the whole limb by a general pressure. That you may be able to support the diseased part with a particular pressure, you must lay compresses upon the hollows and upon the bed of each particular abscess, and change the place of these compresses from time to time, so as now to prevent matter sinking into a particular hollow, now to press it out from a place

where it is already lodged, and again to reunite the surface of an abscess already completely formed, from which the matter has been discharged." (*Principles of Surgery*, Vol. 1.)

In the article *Joints*, we have taken notice of the good effects of the pressure of a roller in the cure of white-swellings. Here we shall just introduce Mr. John Bell's sentiments upon the subject: "In a diseased bursa, as in a relaxation of the knee-joint, that disease, which, with but a little indulgence, a very little encouragement of fomentations, poultices, bleeding, and low diet, would end in white-swelling of the knee; may be stopped even by so simple a matter as a well-rolled bandage. (Vol. 1, p. 127.)

The *uniting bandage*, or *spica descendens*, used in rectilinear wounds, consists of a double-headed roller, with a longitudinal slit in the middle, of three or four inches long. The roller having one head passed through the slit, enables the surgeon to draw the lips of the wound together. The whole must be managed, so that the bandage may act equally. When the wounds are stitched, this bandage supports the stitches, and prevents their tearing through the skin. When the wound is deep, writers advise a compress to be applied on each side, in order to press the deeper part of its sides together. When the wound is very long, two or three bandages should be employed, and great care must be taken, that the pressure is perfectly equable.

Henkel and Richter recommend a uniting bandage, which allows the surgeon to see the wound, over which only narrow tapes cross. The reader, if he should ever wish to employ this contrivance, may read a description of it in Rees' Cyclopaedia, or Motherby's Medical Dictionary, though I confess I could not understand it from the description in those works, until I looked at the plate in Richter's *Anfangsgr. der Wundarzn.* Band 1.

When we make use of a single-headed roller, as a *retentive bandage* only, we should always remember to begin the application of it on the side opposite the wound. The obvious reason for so doing is to prevent a farther separation of the lips of the wound, as the contrary manner of applying the roller would tend directly to divide them. (*Gooch*, Vol 1, p. 143.)

The intention of the *expellent bandage* is to keep the discharge sufficiently near the orifice of the wound to prevent the formation of sinuses. In general, a compress of unequal thickness is necessary; the thinner part of the compress being placed next, and immediately contiguous

to, the orifice of the wound the thicker part below. Before the bandage is applied, the pus must be completely pressed out, and the rolling begin with two, or three, circular turns on the lower part of the compress. The bandage must then be carried spirally upwards, but not quite so tightly, as below. It is afterwards to be rolled downward to the place, where it began.

The *creeping* is a simple bandage, every succeeding turn of which only just covers the edge of the preceding one. It is employed in cases, in which the object is merely to secure the dressings, and not to make any considerable, or equable pressure.

A bandage is termed *compound*, when several pieces of linen, cotton, or flannel, are sewed together in different directions, or when the bandage is torn or cut, so as to have several tails. Such are the T bandage, the suspensory one, the capistrum, &c.

The *eighteen-tailed bandage* is one of the most compound. It is now in general use for all fractures of the leg and thigh, sometimes for those of the forearm, and, frequently, for particular wounds. Its great recommendations are the facility with which it can be undone, so as to allow the parts to be examined, and its not creating, on such an occasion, the smallest disturbance of the disease, or accident.

The eighteen-tailed bandage is made by a longitudinal portion of a common roller, and by a sufficient number of transverse pieces, or tails, to cover as much of the part as is requisite.

Each of the cross pieces is to be proportioned in length to the circumference of the part of the limb, to which it is to be applied; so that in making this sort of bandage for the leg, or thigh, the upper tails will be twice as long as the lower ones. After laying the long part of the bandage on a table, fix the upper end of it in some way, or another. Then begin laying the upper tails across it, and proceed with placing the rest. Each tail must be long enough to extend about two inches beyond the opposite one, when they are both applied. The tails, being all arranged across the longitudinal band, they are to be stitched in this position with a needle and thread. When the bandage is intended for the leg, a piece of the longitudinal part of the roller below, is to extend beyond the tails. This is usually brought under the sole of the foot, and then applied over the inner ankle in the first instance, after the bandage has been put under the limb. Then the surgeon lays down the first of the lower

tails, and covers it with the next one above. In this way, he proceeds upwards, till all the cross pieces are applied, the uppermost one of which he fastens with a pin. This bandage has a very neat appearance. The tails are said to lie better, when placed across the longitudinal piece a little obliquely. (*Pott.*)

The T bandage is, for the most part, used for covering parts of the abdomen and back, and, especially, the scrotum, perinæum, and parts about the anus. Its name is derived from its resemblance to the letter T, and it is, as Mr. John Bell remarks, the peculiar bandage of the body. If the breast, or belly, be wounded, we make the transverse piece, which encircles the body, very broad, and having split the tail-part into two portions, one of these is to be conveyed over each side of the neck, and pinned to the opposite part of the circular bandage, so as to form a suspensory for the latter, and prevent its slipping down. But, says Mr. John Bell, if we have a wound, or disease, or operation, near the groin, or private parts, the tail-part then becomes the most important part of the bandage; then the transverse piece, which is to encircle the pelvis, is smaller, while the tail-part is made very broad. When the disease is in the private parts, perinæum, or anus, we often split the tail according to circumstances; but, when the disease is in one groin, we generally leave the tail-part of the bandage entire and broad.

The *linteum scissum*, or *split-cloth*, is a bandage applied occasionally to the head, and consists of a central part, and six, or eight tails, or heads, which are applied, as follows:

When the cloth has six heads, the middle, or unsplit part of the cloth is applied to the top of the head. The two front tails go round the temples, and are pinned at the occiput; the two back tails go also round the temples, and are pinned over the forehead, the two middle tails are usually directed to be tied under the chin; but, as Mr. John Bell observes, this suffocates and heats the patient, and it is better to tie them over the top of the head, or obliquely, so as to make pressure upon any particular point. (*Principles of Surgery, Vol. 1, p. 131.*)

The old surgeons usually split this middle tail into two parts, a broad, and narrow one. In the broad one, they made a hole to let the ear pass through. This broad portion was tied under the chin, while the narrow ends were tied obliquely over the head. As Mr. John Bell has observed, though this gave the split-cloth the effect of eight tails, yet, the ancient surgeons did not name it the split-cloth

with eight tails. When they split the cloth into eight tails, and, especially, when they tied the eight tails in the following particular manner, they called the bandage *cancer*, as resembling a crab in the number of its legs. The *cancer*, or *split-cloth of eight tails*, was laid over the head, in such a manner, that four tails hung over the forehead and eyes, while the other four hung over the back of the head. They were tied, as follows; first, the two outermost tails, on each side in front, were tied over the forehead, while the two middle tails in front were left hanging over the knot. Then the two outermost, or lateral tails behind were tied round the occiput. Next the middle tails were tied, the two anterior ones being made to cross over each other, and pass round the temples to be pinned at the occiput; while the two middle tails behind, were made to cross each other, and pass round the temples, so as to be pinned over the ears, or near the forehead. (*See John Bell's Principles, Vol. 1, p. 132.*)

The *triangular bandage* is generally a handkerchief doubled in that form. It is commonly used on the head, and, now and then, as a support to the testicles, when swelled. The French term it *couvre-chef en triangle*.

The *nodose bandage* called also *scapha*, is a double-headed roller, made of a fillet four yards long, and about an inch and a half broad. It must be reversed two, or three times, so as to form a knot upon the part, which is to be compressed. It is employed, when a hemorrhage from a wound is to be stopped, or, for securing the compress, after bleeding in the temporal artery.

The most convenient bandage in general for the forehead, face, and jaws is the *four-tailed one*, or *single split-cloth*.

It is composed of a strip of cloth, about four inches wide, which is to be torn at each end, so as to leave only a convenient portion of the middle part entire. This unsplit middle portion is to be applied to the forehead, if the wound be there, and the two upper tails are carried backward, and tied over the back part of the head, while the two lower ones are to be tied either over the top of the head, or under the chin, as may seem most convenient.

When the wound is on the top of the head, the middle of the undivided part is to be applied to the dressings. The two posterior tails are to be tied forward, and the two anterior ones are to be carried backward, so as to be tied behind the head. This is sometimes called *Galen's bandage*. It is curious, that writers on bandages should use the terms *head*, and

tail, synonymously, and hence this *four-tailed bandage* is often called the *sling* with *four heads*. Such confusion of language is highly reprehensible, as it contributes, in a very great degree, to obstruct the comprehension of any, the most simple subject.

If the upper lip be cut, and a bandage needed, which is seldom the case, it is almost superfluous to say, that this bandage will serve the purpose. It serves also in cuts of the lower lip, though there, also, we trust rather to the twisted suture, than a bandage.

The single split-cloth is particularly useful in supporting a fractured lower jaw, and, in such cases, is the only one employed in modern surgery. This bandage, when used for this particular purpose, namely, supporting the lower jaw, is named *capistrum*, or *bridle*, because it goes round the part somewhat like a horse's halter.

"In some cases, (says Mr. John Bell) the circumstances require us to support the chin particularly, and then the unsplit part of the bandage is applied upon the chin with a small hole to receive the point; but, where the jaw is broken, we pad up the jaw-bone into its right shape, with compresses pressed in under the jaw, and secured by this bandage. When we are in fear of hemorrhagy after any wound, or operation, near the angle of the jaw, we can give the sling a very remarkable degree of firmness. For this purpose, we tear the band into three tails on each side, and we stitch the bandage at the bottom of each split, lest it should give way, when drawn firm, &c." (*Principles of Surgery*, Vol. 1.)

We have already described one way of applying a handkerchief, as a bandage to the head, when we noticed the *triangular one*, or *couvre-chef en triangle*. The other manner of applying the handkerchief, called the *grand couvre-chef*, is as follows:

You take a large handkerchief, and fold it, not in a triangular, but a square form. You let one edge project about three finger-breadths beyond the other, in order to form a general border for the bandage. You lay the handkerchief upon the head, so as to make the lower fold, to which the projecting border belongs, lie next the head; while the projecting border itself is left hanging over the eyes, till the bandage is adjusted. The two corners of the outermost fold are first to be tied under the chin; the projecting border is then to be turned back, and pinned in a circular form round the face, while the corners of the fold next the

head are to be carried backward, and tied.

After the outer corners of this bandage have been tied under the chin; after the inner corners have been drawn out and carried round the occiput; and after the border has been turned back and pinned; the doubling of the handkerchief over each side of the neck hangs in a loose awkward manner. It remains, therefore, to pin this part of the handkerchief up above the ear, as neatly as can be contrived. (See *J. Bell's Principles*.)

The grand *couvre-chef* has certainly nothing to recommend it, either in point of utility, or elegance. A common night-cap must always be infinitely preferable to it. In the event, however, of a cap not being at hand, it is proper that the surgeon should know, what contrivances may be substituted to fulfil the objects in view.

Having, in the numerous articles of this Dictionary, noticed the mode of applying bandages in particular cases, and allotted a few separate descriptions for such bandages, as are not here mentioned, but, which are often spoken of in books, we shall conclude for the present, with referring the reader for further information to *Motherby's Medical Dictionary*; *Rees' Cyclopædia*; and *Jahn Bell's Principles of Surgery*, Vol. 1. *Galen and Vidus Vidius are reckoned the best of the old writers on the subject*; *M. Sue, Thillaye, Heister, Lombard, and Bernstein*; of the modern ones. *The latter are said, however, to be all too prolix.* (See *Rees' Cyclopædia*, art. *Bandage*.)

BARK, Peruvian. (See *Cinchona*.)

BA'THIRON. A Greek word, denoting, in a surgical sense, a machine for extending broken limbs, sometimes called the *Scammum Hippocratis*. It is described by Oribasius and Scultetus.

BA'TRACHOS, or BA'TRACHUS. The tumour, which occasionally takes place under the tongue, and is more commonly called *Ranula*.

BDE'LLA. In a surgical sense, a varix, or dilated vein.

BELLADONNA. *Deadly Nightshade* Is violently narcotic. The leaves were first used externally for discussing scirrhus swellings, and they have been subsequently given internally, in scirrhus and cancerous diseases, amaurosis, &c. Five-grains are reckoned a powerful dose: one is accounted enough to begin with. At present, the extract, as directed by the London College, is more commonly prescribed.

From the power, which belladonna is known to possess, of lowering the action of the whole arterial system, it seems to

be a fit medicine in many surgical cases, where that object is desirable, particularly in examples of aneurism.

A very peculiar virtue, which belladonna has, is that of causing a dilatation of the pupil, when used as an external application to the eye-brow and eye-lids. The late Mr. Saunders was in the habit of employing belladonna a good deal for this express purpose. A little while before undertaking the operation for the congenital cataract, he was accustomed to introduce some dissolved extract of belladonna between the eye-lids, or rub the eye-brow and skin about the eye freely with the same application. The consequence was, that, if there were no adhesions of the iris to other parts, a full dilatation of the pupil was produced in less than an hour, and the whole of the cataract was distinctly brought into view. This was unquestionably a considerable improvement in practice, as the iris was kept out of danger, and the operation materially facilitated. I allude here more particularly to Mr. Saunders's own method, in which he introduced the needle through the cornea, in front of the iris, and then conveyed it to the cataract through the enlarged pupil. Belladonna was also externally applied by Mr. Saunders, after the operation, with a view of preventing the edge of the iris from becoming adherent to the edges of the torn capsule.

BINOCULUS. (from *binus*, double, and *oculus*, the eye.) A bandage for keeping dressings on both eyes. Its application will easily be understood by referring to *Monoculus*.

BISTOURY. (*Bistoir*, French.) any small knife for surgical purposes.

BLADDER, Puncture of. This is an operation, to which we are obliged to have recourse, after having in vain employed all the other means indicated for preventing the bad, and even fatal consequences of a stoppage of the evacuation of the urine, and distention of the bladder. Various accidents, and diseases, both acute and chronic, may occasion this dangerous state, as we shall more particularly notice in the article, *Urine, Retention of*.

The bladder, which can conveniently hold about a pint and a half of urine, is no sooner dilated, so as to contain two pints, than uneasy sensations are experienced. The desire of discharging the water now becomes very urgent, and if the inclination be not gratified, and the bladder be suffered to be dilated beyond its natural state, it loses all power of contraction, and becomes paralytic. The

desire, indeed, continues, and the efforts are renewed in painful paroxysms; but, the power is lost, and the bladder becomes more and more distended. When this viscus is dilated in the utmost degree, and neither its own structure, nor the space in the abdomen can allow a further distention; either the bladder must be lacerated, which it never is, so equally is it supported by the pressure of the surrounding parts; or its orifice must expand and the urine begin to flow. After the third day of the retention, the urine often really begins to flow, and, whatever descends from the kidneys is evacuated in small quantities from time to time, and at this period, the bladder is distended in as great a degree, as it ever can be, however long the patient may survive. This dribbling of the urine, which begins, when the bladder is dilated to the utmost, and continues till the eighth, or tenth day, or till the bladder sloughs, has long been understood, and is named by the French, "*urine par régorgement*." To practitioners, who do not understand it, the occurrence is a most deceitful one. The friends felicitate themselves, that the urine begins to flow; the surgeon believes it, basins and cloths, wet with urine, are easily produced; but, the patient lies unrelieved. The continued distention of the bladder is followed by universal inflammation of the abdomen. The insensibility, and low delirium of incipient gangrene, are mistaken for that relief, which was expected from the flow of urine, till either hiccough comes on, and the patient dies of fever, and inflammation, or the urine gets through an aperture, formed by mortification, into the abdomen. Let no surgeon, therefore, trust to the reports of nurses and friends, but, lay his hand upon the hypogastric region, and tap with his finger, that he may distinguish the distended bladder, and the fluctuation of urine. As the bladder suffers no further distention, after the third day, why should it burst? Not from laceration; for, it is supported by the uniform pressure of the surrounding viscera; not by yielding suddenly, for it is distended to its utmost on the third day of the retention, and yet seldom gives way before the tenth; not by attenuation, for it becomes thickened. The term *laceration* was never more wrongly applied, than in this instance; for, when there is a breach in the bladder, it is found, on dissection, to be a small round hole, such as might be covered with the point of the finger. The rest of the viscus, and the adjacent bowels, are red and inflamed, while this single point is black, and mortified. Delay is more dangerous,

than even the worst modes of making an opening into the bladder, and, while life exists, the patient should have his chance. — (See *John Bell's Principles of Surgery*, Vol. 2, Part 1, p. 262, &c.)

That many patients die after the paracentesis of the bladder is an undoubted truth, and this circumstance has rather intimidated practitioners against the operation. It appears to me, however, that death may in general be more fairly ascribed to the effects of the disease, than to the puncture of the bladder, and that, if this last measure were not deferred so long, as it often is, the recoveries would be more numerous.

Hence, when relief cannot be obtained by the treatment described in the article, *Urine, Retention of*; when no urine has come away, before the end of the third day; when it only does so in a dribbling manner after this period, while the bladder continues distended, and no catheter can be introduced; the operation should not be delayed. In urgent cases, one should rather operate, as soon as forty-eight hours have elapsed.

No doubt, a man, who is exceedingly skilful in the use of the catheter, and knows how to practise with science and judgment all the other means for relieving the retention of urine, will not frequently find it necessary to have recourse to the operation of puncturing the bladder. This is said to have been so much the case with the eminent Desault, that, in the course of ten years, he had occasion only once to perform such an operation in the Hôtel Dieu, where diseases of the urethra are always extremely numerous. (See *Œuvres Chir. de Desault par Bichat*, Tom. 2, p. 316.) When, however, this superior manual dexterity with the catheter is not the acquirement of the practitioner, the timely performance of the paracentesis of the bladder should ever be observed. I shall next treat of the three modes of doing the operation.

1. Puncture through the Perineum.

The first surgeon that ever performed this operation is said to have been M. Tolet, a French surgeon, well known for a valuable treatise, entitled, "*Traité de Lithotomie, ou de l'extraction de la pierre hors de la vessie, Troisième édition, Paris 1681.*" According to Sabatier, it was customary, at the time of Dionis, to make the opening with a narrow pointed scalpel, about four or five inches long, which was plunged into the bladder, at the place where the incision in the apparatus major terminated. (See *Lithotomy*.) The escape of the urine indicated when the surgeon had reached the bladder. A straight

probe was then conducted along the knife, and, then a cannula was passed along the probe into the bladder, where it was allowed to remain as long as necessary, care being taken to fix it by means of tapes, passed through the rings at the broad part of the instrument; and to stop up the opening with a linen tent. Some practitioners, however, began with cutting the perineum, after introducing a staff as far into the urethra as possible. Having made an opening into this canal, they conveyed a gorget along the staff into the bladder, and a cannula was next passed into the same viscus along the gorget, and allowed to continue there. This mode of proceeding, which Sabatier terms more methodical, than that which has been first mentioned, could only answer in cases, where the obstruction about the neck of the bladder was inconsiderable, and where in fact the introduction of the catheter was not yet impracticable. At least, therefore, the method was unnecessary. The other plan of piercing the urethra in several places, and making a passage for the urine through the prostate, says Sabatier, increased the inflammation, with which this gland was affected, and rendered the disease, if not mortal, at least much more difficult of cure.

Sabatier represents Dionis, as the first who suggested the method of opening the bladder on one side of the perineum, at the part, where Frère Jacques used to perform lithotomy. Dionis conceived, that, by operating in this way, the patient would suffer less pain, because neither the urethra, nor the neck of the bladder, would be injured; but at the same time, he has recommended a process to be followed, which was similar to that pursued in making the puncture in the middle of the perineum, viz. that a narrow scalpel should first be introduced, so as to make a passage for the probe, along which the cannula is to pass into the bladder. The idea of substituting for these unsuitable instruments a Trocar of convenient length was exceedingly simple, and, for this improvement, which took place in 1721, surgery is indebted to Juncker, (See *Conspectus Chirurgiæ*, Tab. 97, p. 674,) unless the following passage be correct: "In the year 1717, or 1718, M. Peyronie shewed in the King's garden a long trocar, which he had successfully employed in a similar puncture." (*Desault's Parisian Chirurgical Journal*, Vol 2, p. 267.)

The patient having been placed in the same position as for lithotomy, an assistant is to press with his left hand on the region of the bladder, above the pubes, in order to propel that viscus as far down-

ward into the lesser pelvis as possible, while, with his right hand, he supports the scrotum. The surgeon is then to introduce the trocar at the middle of a line, drawn from the tuberosity of the ischium to the raphe of the perineum, two lines more forward than the verge of the anus. The instrument is first to be pushed in a direction parallel to the axis of the body; and its point is afterwards to be turned a little inwards. Here, according to Bichat, there is no occasion to convey the cannula so far into the bladder, as is done, when the operation is performed above the pubes. The portion of this viscus, that is pierced, being incapable of changing its position, with regard to other parts in the perineum, if the cannula only project a few lines into its cavity, it will not be liable to slip out. It would be wrong, indeed, to carry it in further; for, the pressure of its end against the posterior parietes of the bladder would do harm. Lastly, the cannula is to be fixed in its place, by means of the T bandage. (See *Euvres Chirurgicales de Desault*, Tom. 3, p. 320.)

Some writers recommend the introduction of the left index finger into the rectum, in order to draw this intestine out of the way; but Sabatier thinks it better to use this finger for pressing on the part of the perineum, where the puncture is about to be made, so as to make the skin tense, and assist in the guidance of the trocar. (*Médecine Opératoire*, Tom. 2, p. 126.)

The parts, divided in this puncture, are the skin, a good deal of fat, and cellular substance, the levator ani muscle, and that portion of the lower part of the bladder, which is situated on one side of its neck.

The following is the judgment which Bichat has passed upon this method: There is in the track, which the trocar describes, no part, of which the puncture must of necessity give rise to bad symptoms. A surgeon, moderately exercised in the practice of this operation, is almost always sore of piercing the bladder. This viscus is opened in the most depending situation, at a part, which constantly bears the same relation to the perinæum. But, the position, in which the patient is placed for the operation, is a great deal more disagreeable, than that for the puncture above the pubes. Several assistants are required to fix him, and one is necessary for compressing the bladder in the hypogastric region. There is a possibility of wounding the vessels of the perineum, and of pricking the nerves, which accompany them. If the point of the trocar is carried too much outwards,

it may glide on the external side of the bladder. If it is inclined forwards, it may slip between this viscus and the pubes. If it is turned too much inwards, it may pierce the prostate gland. If directed too much backwards, it may wound the vasa deferentia, the rectum, the extremity of the ureter, and the vesiculæ seminales. While the cannula is kept introduced, also, the patient can neither walk about, nor sit down; but, must continually keep himself in bed. Lastly, this mode of operating is frequently counter-indicated, by tumours, or other common diseases, at this part of the body, in consequence of retentions of urine. (*Euvres Chirurgicales de Desault par Bichat*, Tom. 3, p. 321.)

The puncture of the bladder from the perineum is now almost universally abandoned by British surgeons. "We may esteem it fortunate," says Desault, "if the trocar penetrates directly into the bladder, after piercing the fat and the muscles, situated between the tuberosity of the ischium and the anus; and, as this viscus is subject to much variation in its form, the surgeon will be often defeated, unless he is perfectly clear in his ideas, respecting its situation and figure. This disappointment is not without example, and there is sufficient to deter a practitioner from performing this operation, independently of the danger of wounding with the trocar the vasa deferentia, vesiculæ seminales ureter," &c. (*Parisian Surgical Journal*, Vol. 2, p. 267.)

If there are now any practitioners, who may be averse to the total relinquishment of this method, I think the following caution, given by Sabatier, may be of service to them: perhaps, the operation would be more safe, if the surgeon were to begin with making a deep incision in the perineum, as is practised in the lateral way of cutting for the stone, and if he were to desist from plunging the trocar into the bladder, until he had assured himself of the situation of this viscus, and felt the fluctuation of the urine. Garengot has given this advice to Foubert, in regard to the mode of cutting for the stone practised by the latter, and it seems equally applicable in the present place. (*Médecine Opératoire*, Tom. 2, p. 127.)

2. Puncture above the Pubes.

The invention of the method of tapping the bladder from above the pubes was suggested by the practicableness of extracting calculi from that viscus, by what is usually denominated the high operation. The first performers of the puncture above the pubes are said to have

employed a straight trocar, the very same instrument as was used for tapping the abdomen in cases of dropsy. The consequence was, that when such a trocar was too long, its cannula was apt to hurt the opposite parietes of the bladder, so as to occasion inflammation and a slough, on the separation of which the urine was liable to insinuate itself either into the abdomen, or rectum, as happened in a case mentioned by Mr. Sharp, where no more urine was discharged through the cannula, and the patient died of a sort of diarrhæa. When the trocar is short, the bladder, on subsiding and contracting itself, gradually quits the cannula, which becomes useless, and a necessity for making another puncture is produced. Whatever pains may be taken to direct the trocar obliquely downwards and backwards, so that the cannula may be, in some degree, parallel to the axis of the bladder, one, or the other of these accidents, cannot always be prevented.

Their prevention, however, may be effected by merely employing, instead of a straight trocar, a curved one, which will naturally take a suitable direction. This improvement was embraced by Frère Côme, the inventor of the lithotome caché, who also devised a curved trocar, for the paracentesis of the bladder, very superior to the instrument of the same shape previously in use.

To this way of operating, Mr. Sharp was partial, and Mr. Abernethy has more recently recommended it, under certain circumstances. The former celebrated surgeon remarks, that it is an operation of no difficulty to the surgeon, and of little pain to the patient, the violence done to the bladder being at a distance from the parts affected. It is equally applicable, whether the disorder be in the urethra, or prostate gland, and when there are strictures, the use of bougies may be continued, while the cannula remains in the bladder. (*Critical Enquiry*, p. 125, edit. 4.)

Some writers recommend making an incision, about two inches long, through the linea alba, a little way above the pubes, and then introducing a trocar into the bladder. Others deem this preliminary incision quite useless, asserting, that the operation may be performed with equal safety, and less pain to the patient, by puncturing at once the skin, the linea alba, and the bladder. When the trocar has been introduced, the stilette must be withdrawn, and the cannula kept in its position by a ribbon, passed through two little rings, with which it should be constructed, and fastened round the body.

The orifice of the cannula should be

stopped up with a little plug, so as to keep the urine from dribbling away involuntarily, and taken out as often as occasion requires. (*Encyclopédie Méthodique; Part. Chirurg. Art. Paracentese de la Vessie.*)

The trocar should be introduced in a direction obliquely downward and backward; for as this corresponds with the axis of the bladder, the instrument is less likely to injure the opposite side of that organ.

Nearly all writers advise the puncture to be made an inch, or an inch and a half, above the pubes. The reasons for so doing are the following: "If the puncture be made close to the os pubis, the bladder in that part, often rising with an almost perpendicular slope, leaves a chasm between it and the abdominal muscles, or, to speak more strictly, a certain depth of membrana cellularis only, so that, if the trocar penetrate but a little way, it possibly may not enter into the bladder. If it penetrates considerably, it may pass through the bladder into the rectum, or, if not in the operation itself, some days afterwards, when by the course of the illness and confinement the patient is more wasted. For, the abdominal muscles, shrinking and falling in, occasion the extremity of the cannula to press against the lower part of the bladder, and, in a small time, to make a passage into the rectum." (*Sharp in Critical Enquiry*, p. 127.) Though the reasons here adduced seem at first as formidable, as they are numerous, does not the danger of injuring the peritoneum, form an objection to plunging in a trocar at the above distance from the pubis? Certain it is, peritonitis would be more apt to be induced by such practice, than by introducing the instrument immediately above the pubes. Richerand decidedly condemns the plan, principally because the higher the puncture is made, the more apt will the bladder be to quit the cannula, on the urine being discharged. (See *Nosographie Chirurgicale*, Tom. 3, p. 472, edit. 2.) In Desault's works, by Bichat, the puncture is also advised to be made immediately above the pubes. Tom. 3, p. 318. Some of Mr. Sharp's objections are done away, by taking care to pass the trocar into the bladder in the axis of this viscus, and employing one which is somewhat curved, as Hunter, Frère Côme, Sabatier, &c. have advised. Mr. Sharp confirms the danger of using too long a cannula, by mentioning an accident, which occurred in his own practice. Though he introduced the instrument more than an inch and a half above the os pubis, yet having pushed it full two inches and a half, below the surface of the skin, its

extremity in six, or seven days insinuated itself into the rectum. (*Critical Enquiry*, p. 127.) The instrument, says an excellent writer, should be more or less long, according to the embonpoint of the patient; but, the ordinary length should be about four inches and a half. The curvature should be uniform, and form the segment of a circle about eight inches in diameter. (*Œuvres Chir. de Desault par Bichat*, Tom. 3. p. 317.)

A catheter left in the bladder, longer, than ten days, may possibly gather such an incrustation from the urine, as not only to render the extraction of it painful, but even impracticable. This should caution us, therefore, never to leave the cannula in the bladder quite a fortnight. If necessary to leave one so long, Mr. Sharp advises a second one to be introduced, made with an end, like that of a catheter. (*Critical Enquiry*, p. 129.)

Mr. Abernethy first made an incision, between the pyramidal muscles, passed his fingers along the upper part of the symphysis pubis, so as to touch the distended bladder, and introduced a common trocar, of the middle size, in a direction obliquely downwards. On withdrawing the stilette, he passed a middle-sized hollow elastic catheter, through the cannula, into the bladder. The cannula was withdrawn, and the catheter left in, till the urine passed through the urethra. After a week, as the instrument was stopped up with mucus, it was taken out, and a new one introduced. (*Surgical Observations*, 1804.) It might be objected to this plan of employing a hollow bougie, that, as it is smaller, than the wound, the urine is not kept from passing between the instrument, and parts, into which it is introduced, as well as through the tube itself. This happened in Mr. Abernethy's case, and, though no urine in this instance, got into the cellular membrane; yet, it would probably do so sometimes, because, it is not till after inflammation has taken place, that the cavities of the cellular substance are closed by coagulating lymph. After a time, however, the cannula of the trocar might be withdrawn, and the hollow bougie employed, if preferred, though it seems difficult to discover a reason for chusing it.

The following is one of Mr. Home's conclusions: (*Med. and Chir. Trans. Vol. 2.*) "When the puncture is made above the pubis, the cannula, which incloses the trocar is not to be removed, till the surrounding parts have been consolidated by inflammation, so as to prevent the urine in its passage out from insinuating itself into the neighbouring parts; for whenever the urine lodges, mortification takes

place. Any advantage, therefore, which may arise from a more flexible instrument remaining in the bladder, is more than counterbalanced by its not filling completely the aperture through the coats of the bladder, and allowing the urine to escape into the cellular membrane."

There is much truth in the following passage: The abdomen is inflamed; the preliminary incisions, which prepare for the introduction of the trocar, sometimes pass through several inches, of fat, and cellular substance; the incisions must be wide in proportion to their depth; the cannula is no sooner lodged here, than it is displaced, in some degree, by the contraction of the bladder, which, when emptied, subsides under the pubis. The cannula stands so obliquely, that the urine never flows with ease, but, by running out upon the wound, and by being injected among the cellular substance, it causes the wound to inflame; the wound by its proximity to the inflamed peritonæum soon mortifies, and thus, notwithstanding the temporary relief, produced by the emptying of the bladder, the patient dies on the third or fourth day. (*John Bell's Principles of Surgery*, Vol. 2, p. 271.)

That this operation is infinitely better, than that of making the puncture in the perineum is indisputable. There are even now some good surgeons, who seem to prefer it to the method of tapping the bladder from the rectum. In the *Œuvres Chirurgicales de Desault*, Tom. 3, p. 324, it has received the preference, and at p. 319 of the same book, a high encomium is bestowed on it, in the following terms. "This operation is easy. The little thickness of the parts, which are to be wounded, renders it quick and triflingly painful. The surgeon has occasion for no assistance. The patient is neither intimidated, nor fatigued with the posture in which he is put. It is almost impossible to miss the bladder, except it were exceedingly contracted. There is no risk of piercing the cavity of the abdomen. Anatomy proves, that here the bladder is in immediate contact with the recti muscles, and that when this viscus is distended with urine, it pushes the peritonæum upwards and backwards, under which membrane it enlarges, and thus makes the point of the trocar become more and more distant from the cavity of the abdomen. The patient may easily lie on his side, or abdomen, so as to discharge all the urine contained in the bladder. There are here no nerves, nor vessels, of which the injury can be dangerous. No difficulty is experienced in fixing the cannula, and the presence of this instrument does not hinder the patient from sitting, standing

up, or even walking about in his chamber. When the cannula, also, is introduced to the lower part of the bladder, this viscus cannot possibly quit it. Lastly, the wound heals with more facility, than that made in any other method."

Respecting this advice to push the cannula so far into the bladder, it is highly objectionable, for the reason already explained. The writer of the preceding commendation seems to me rather too partial. He has told us of the little thickness of the wounded parts, and, yet a little before bestowing these praises, he has acknowledged, "*il est rare, que dans cette ponction, on traverse directement la ligne blanche: on passe presque toujours sur ses côtés, et l'on divise la peau, l'aponévrose des muscles larges du bas-ventre, les muscles droits, quelquefois l'un des pyramidales, et la paroi antérieure de la vessie.*" (Tom. 3, p. 318.)

According to my own judgment, the plan, which is about to be described, is the safest and best, when the circumstances of the case afford a choice, and that it would be for the benefit of the afflicted, if the puncture above the pubes were only performed in cases in which the enormous enlargement of the prostate gland prevents a puncture from being safely made from the rectum.

3. Puncture from the Rectum.

This method is more generally applicable, than either of the two plans above related. It is not, like the puncture in the perinæum, liable to the objection, that the wound is made on diseased or inflamed parts, which afterwards become gangrenous. Nor is it, like the puncture above the pubes, attended with a chance of the urine diffusing itself in the cellular membrane. It has also the advantage of emptying the bladder completely. The puncture is made sufficiently far from the neck of the bladder not to increase any inflammation existing in that situation; and the operation is really attended with little pain, since there is no skin, nor muscles to be wounded, merely the coats of the bladder and rectum, at a point where these viscera lie in contact with each other. The enlargement of the prostate gland, is, perhaps, the only solid reason against its being uniformly preferred.

When the bladder is to be tapped from the rectum, two fingers should be introduced into the intestine, instead of one, as has been directed. In this manner, the cannula can be more conveniently guided, and held in a proper position, while the trocar is introduced with the other hand. The silette, however, must never be introduced into the cannula,

except when this is properly placed, with its extremity against the part, where it is intended to make the puncture.

We read in the *Philosophical Transactions* for 1776, of a case of total retention of urine, from strictures, where the bladder was successfully punctured from the rectum. Mr. Hamilton, who did the operation, thought of the plan, in consequence of feeling the bladder exceedingly prominent in the rectum, on introducing his finger into the anus.

The patient was placed in the same position as that in lithotomy; a trocar was passed along the finger into the anus, and pushed into the lowest, and most projecting part of the swelling, in the direction of the axis of the bladder. A straight catheter was immediately introduced through the cannula, lest the bladder by contracting should quit the latter, which was taken away, and, as soon as the water was discharged, the catheter was also removed. Notwithstanding the puncture, the bladder retained the urine as usual, until a desire to make water occurred. Then the opening made by the instrument seemed to expand, and the water flowed in a full stream from the anus. The urine came away, in this manner, two days, after which it passed the natural way, with the aid of a bougie, which had been passed through the uréthra, into the bladder, and which was used, till all the disease in this canal was cured.

The method is said to have been originally proposed in 1750, by M. Fleurant, surgeon of the hospital *La Charité*, at Lyons, and Pouteau, in 1760, published an account of it, and three cases in which Fleurant had operated. It was also the feel of the bladder, on the introduction of a finger *intra anum*, which led the latter surgeon to choose making a puncture in this situation. The urine was immediately discharged, and the cannula supported in its place with the T bandage, until the natural passage was reduced previous again. But the cannula, being allowed to remain in the rectum, became incommodious to the patient, when he went to stool, and, the inconvenience was vastly increased by the continual dribbling of the urine from the mouth of the instrument. Hamilton avoided both these inconveniences, by withdrawing the cannula at first. In another instance, however, Fleurant left the cannula in the anus and bladder, thirty-nine days, without the least inconvenience.

In order to lessen the inconvenience, attending the presence of the cannula, Fleurant suggested that it would be better to

have the tube made of a flexible substance; a proposal, that seems to merit attention, though, I believe, the inconveniences of wearing the cannula are not in general very serious, and, were a case of this kind to present itself, I should have no hesitation in withdrawing the tube altogether.

In the first volume of the *Mem. of the Medical Society of London*, two cases are related, in which, after tapping the bladder from the rectum, the cannula was immediately withdrawn, without any bad effect. Another similar fact is recorded in the *Medical Communications*, Vol. 1.

A long, curved, cylindrical trocar, is the best for performing the operation, and was the one recommended by Pouteau. It should be introduced a little beyond the prostate gland, exactly in the centre of the front of the rectum, and sufficiently far up this intestine. In this way the vesiculæ seminales, which diverge from each other above, cannot be injured; and, even were they so, perhaps no serious consequences would follow.

It is not necessary to retain the cannula in the puncture, after the inflammation has consolidated the sides of the wound, and there is no danger of the aperture closing up, till there is another passage made for the urine. Mr. Home thinks, that after about thirty-seven hours, the cannula may be properly taken out. (*Med. and Chir. Trans.* Vol. 2.) Indeed, I am not acquainted with any fact, shewing the ill effect of removing the cannula at once; for, here the urine has only to pass through a mere opening, without any longitudinal extent, as after puncturing above the pubes. The safety and simplicity of tapping the bladder from the rectum, will always recommend this method with impartial practitioners. The wound is made at a distance from the peritoneum, passes through no thickness of parts, and is quite unattended with any chance of the urine becoming extravasated in the cellular substance. Whether the bladder be morbidly contracted and thickened; whether the neck of the bladder be inflamed; it is equally applicable: the diseased enlargement of the prostate gland, can alone warrant the puncture above the pubes being ever preferred.

I am happy to join the experienced and judicious Mr. Hey with the advocates for this mode of performing the operation, and as his opinion on this subject must have considerable influence, I shall quote the following passage from his valuable work, particularly as the observations confirm some other points adverted to in

the present article. "It is sometimes impossible, from various causes, to make a catheter pass through the urethra. The puncture of the bladder then becomes necessary, if the retention of urine continues. This operation may be performed, either above the pubes, or through the rectum. I have seen it performed in both these methods; but, give the preference to the latter. It is more easy to the surgeon; and less painful to the patient. Pouteau's carved trocar is a very convenient instrument; and may be used with safety for puncturing the bladder through the rectum; but, the operator should cautiously avoid wounding an artery, which may be felt running towards the anus, where the bladder is most protuberant. The finger, which is introduced into the rectum to guide the trocar, may be conveniently placed a little on either side of this vessel. It is not always necessary to leave the cannula in the bladder, as the urine sometimes begins to flow through the penis, within a few hours after the bladder is emptied. Perhaps, this event may be the most frequent, when the introduction of the catheter has been prevented by a stricture in the urethra. If the wound becomes closed, before the power of expelling the urine is regained, recourse must be had to a repetition of the operation, which gives very little trouble to the patient; neither is he much incommoded by suffering the cannula to remain two or three days in the bladder. This is sometimes necessary, and seldom improper." (*Hey's Practical Observations in Surgery*, p. 430—431, edit. 2.)

Women seldom stand in need of the paracentesis of the bladder; but, when the operation is necessary in them, it is more safely and easily performed from the vagina, than in any other way. If it should be proper to leave in the cannula, this must be long enough to allow its orifice to be situated on the outside of the labia, where it must be fixed with a T bandage.

Consult particularly Sharp on the Operations, Chap. 15, and his Critical Enquiry. *L'Encyclopédie Méthodique, Partie Chirurgicale*; art. *Paracentèse de la Vessie*. Sabatier's *Médecine Opératoire*, Tom. 2. *Med. and Chir. Transactions*, Vol. 2. Abernethy's *Surgical Observations*, 1804. John Bell's *Principles of Surgery*, Vol. 2. *Œuvres Chirurgicales de Desault par Bichat*, Tom. 3, p. 315, &c. Richerand's *Nosographie Chirurgicale*, Tom. 3, p. 471, &c. edit. 2. Hey's *Practical Observations in Surgery*, p. 430, edit. 2. *Mélanges de Chirurgie*, par Pouteau, Lyon, 1760, p. 500. *Parisian Chirurgieal Journal*, Vol. 2, p. 156, and p. 265.

BLADDER, Tumour extirpated from. Mr. Joseph Warner, surgeon of Guy's Hospital, has recorded a case, in which an excrescence, growing from the inside of a young woman's bladder, was successfully removed. The patient, on the 24th of June, 1747, strained herself in endeavouring to lift a great weight, and she was immediately seized with a pain in the small of her back, and a total retention of urine. In April, 1750, she applied to Mr. Warner, who found, upon enquiry, that she had never been able, from the moment of the accident, to void a drop of urine, without the assistance of the catheter; that she was in continual pain, and had lately been much weakened, by having several times lost considerable quantities of blood, occasioned by the force made use of in introducing the instrument into the bladder.

Mr. Warner, upon examining the parts, with his forefinger, which he had great difficulty in introducing into the meatus urinarius, discovered a considerable tumour, which seemed to be a fleshy substance, and took its rise from the lower part of the bladder near its neck. When the patient strained to make water, and the bladder was full, the excrescence protruded a little way out of the meatus urinarius; but upon ceasing to strain, it presently returned.

A purgative having been given the day before the operation, and the rectum emptied by means of an emollient clyster, Mr. Warner directed the patient to strain, so as to make the swelling project. He then hindered it from returning into the bladder by passing a ligature through it, and endeavoured to draw it further out.—The latter object was found impracticable, on account of the size of the tumour. Seeing this, Mr. Warner dilated the meatus urinarius on the right side, by cutting it upwards, about half way towards the neck of the bladder, when, by pulling the swelling forwards, he was enabled to tie its base, which was very large, with a ligature.

For three days after the operation, a good deal of pain was felt in the abdomen. On the sixth day, the tumour dropped off. From the first day, the urine came away without assistance, and the patient got quite well. The tumour resembled a turkey's egg in shape and size. (See *Warner's Cases in Surgery*, edit. 4, p. 303.)

Perhaps, in this example, tying the tumour was preferable to cutting it away, even though its base was large; for, had the knife been used, there would have been some danger of the bladder becoming filled with blood.

BLADDER, Hernia of. See *Hernia*.

BLADDER, Insects discharged from. The instances in which worms are stated to have been discharged from the bladder, are very numerous. Many cases of this kind are referred to in Voigtel's *Handbuch der pathologischen Anatomie*, b. 3, p. 337—342. A most interesting example has also been lately recorded by Mr. William Lawrence. (See *Medico-Chirurgical Transactions*, Vol. 2, p. 382, &c.)

BLADDER, Deficiency of. Numerous examples, in which this deviation from the natural structure has occurred, are recorded by medical writers. The publications, however, which, as far as I know, contain the most ample information, on the subject, are, a Gottingen inaugural dissertation, entitled, "*De Vesicae Urinarie Prolapsu Natio*," by Dr. Roose, late professor in Brunswick, and a paper, called, "*An attempt towards a systematic account of the appearances, connected with the malconformation of the Urinary Organs, in which the ureters, instead of terminating in a perfect bladder, open externally on the surface of the Abdomen*," by A. Duncan, jun. in *Edinb. Med. and Surgical Journal*, Vol. I. In this last production may be seen references to all the most noted cases on record, both male and female.

BLADDER. Wounds of. See *Gunshot Wounds*.

BLEEDING. By this operation is understood the taking away of blood for the relief of diseases. Bleeding is called *general*, when practised with a view of lessening the whole mass of circulating blood; *topical*, when performed in the vicinity of the disease, for the express purpose of lessening the quantity of blood in a particular part.

General Blood-letting is performed with a lancet, and is subdivided into two kinds; viz. the opening of a vein, termed *phlebotomy*, or *venesection*; and the opening of the temporal artery, or one of its branches, termed *arteriotomy*.

Topical Blood-letting is performed, either by means of a cupping-glass and scarificator, by leeches, or by dividing the visibly distended vessels with a lancet. The latter is frequently done in cases of ophthalmia.

PHLEBOTOMY, OR VENESECTION.

The mode of bleeding most frequently practised is that of opening a vein; and it has been done in the arm, ankle, jugular vein, frontal vein, veins under the tongue, on the back of the hand, &c. In whatever part, however, venesection is performed, it is always necessary to compress the vein, between the place where

the puncture is made, and the heart. Thus the return of blood through the vein is stopped, the vessel swells, becomes conspicuous, and when opened, bleeds much more freely than it would otherwise do. Hence, according to the situation of the part of the body where the vein is to be opened, with regard to the heart, the fillet for making the necessary pressure must be applied, either above, or below the puncture.

All the apparatus essential for blood-letting, on the part of the patient, is a bandage, or fillet, two or more small pieces of folded linen for compresses, a basin to receive the blood, and a little clean water and a towel. The bandage ought to be about a yard in length, and near two inches broad, a common ribbon or garter, being frequently employed. The compresses are made by doubling a bit of linen rag, about two inches square. On the part of the surgeon, it is necessary to have a good lancet, of proper shape. He should never bleed with lancets with which he has been in the habit of opening any kind of abscesses, as very troublesome complaints have been the consequence of doing so. The shape of the instrument is also a matter of some importance. If its shoulders are too broad, it will not readily enter the vein, and when it does enter, it invariably makes a large opening, which is not always desirable. If the lancet be too spear-pointed, an incautious operator would often run a risk of transfixing the vein, and wounding the artery beneath it. More, however, certainly depends on the mode of introducing the lancet, than on its shape.

In blood-letting, the patient may lie down, sit down, or stand up, each of which positions may be chosen according to circumstances. If the patient be apt to faint from the loss of a small quantity of blood, and such fainting can answer no surgical purpose, it is best to bleed him in a recumbent posture. But, when the person is strong and vigorous, there is little occasion for this precaution, and a sitting posture is to be preferred, as the most convenient, both for the surgeon and patient. This, indeed, is the common position. In some cases, however, particularly those of strangulated hernia, it is frequently an object to produce fainting, in order that the bowels may be more easily reduced. In this circumstance the patient may be bled in an erect posture, and the wound made large, as a sudden evacuation of blood is particularly apt to bring on the wished for swoon. For the same reason, if we wish to avoid making the patient faint, we should then make only a small puncture.

Every operator should be able to use the lancet with either hand, which will enable him to bleed the patient in the right or left arm, as circumstances may render most eligible.

At the bend of the arm, there are several veins in which a puncture may be made; viz. the basilic, cephalic, median basilic, and median cephalic. The median basilic vein, being usually the largest and most conspicuous, is that, in which the operation is mostly performed: but, surgeons should never forget, that it is under this vessel that the brachial artery runs, with the mere intervention of the aponeurosis sent off from the tendon of the biceps muscle. In very thin persons, indeed, the median basilic vein lies almost close to the artery, and nothing is then more easy than to transfix the first of these vessels and wound the last. Hence, Richerand advises all beginners to prefer opening the median cephalic, or even the trunk of the cephalic itself, to puncturing either the basilic, or the median basilic, which last are internally situated, and nearer the brachial artery. (*Nosographie Chirurgicale, Tom. 3, p. 383, Edit. 2.*)

In exceedingly fat subjects, the large veins at the bend of the arm are sometimes totally imperceptible, notwithstanding the fillet is tightly applied, the limb is put in warm water, and every thing done to make those vessels as turgid as possible. In this circumstance, if the surgeon has not had much experience in the practice of venesection, he will do well to be content with opening one of the veins of the back of the hand, after putting the member for some time in warm water, and applying a ligature round the wrist. In children, a sufficient quantity of blood cannot always be obtained by venesection, and, in this event, the free application of leeches, and occasionally, the puncture of the temporal artery, are the only effectual methods.

With respect to the choice of a vein in the arm, the most experienced operators give a preference to one, which rolls least under the skin. Such a vessel, though sometimes less superficial, than another, may commonly be opened with greater facility. The surgeon, however, is always to fix the vein, as much as he can, by placing the thumb of his left hand a little below the place, where he intends to introduce the lancet.

In bleeding in the arm, the fillet is to be tied round the limb, a little above the elbow, with sufficient tightness to intercept the passage of the blood through all the superficial veins; but, never so as to stop the flow of blood through the arteries, which would tend to prevent the veins from rising at all. The veins being thus render-

ed turgid, the surgeon must choose the one which seems most conveniently situated for being opened, and large enough to furnish as much blood as it may be proper to take away.

Before applying the fillet round the arm, however, the operator should always feel where the pulsation of the artery is situated, and, if equally convenient, he should not open the vein immediately over this part. It is also prudent to examine where a pulsation is situated, on account of the occasional varieties in the distribution of the arteries of the arm. The ulnar artery is sometimes given off from the brachial very high up, and, in this case, it frequently proceeds superficially over the muscles, arising from the internal condyle, instead of dividing under them, in the ordinary manner.

When the external jugular vein is to be opened, the surgeon generally makes the necessary pressure with his thumb. The orifice should be made in the direction of the fibres of the platysma myoides muscle; and the vein is not so apt to glide out of the way, when the surgeon makes the puncture just where it lies over a part of the sterno-cleido-mastoideus muscle.

When blood is to be taken from the foot, the ligature is commonly applied a little above the ankle.

The fillet having been put on the arm, the operator is to take the blade of the lancet, bent to a somewhat acute angle, between the thumb and fore-finger, and, steadying his hand upon the other three fingers, he is to introduce the lancet, in an oblique direction, into the vessel, till the blood rises up at the point of the instrument. Then bringing up the front edge in as straight a line as possible, the wound in the skin will be made of just the same size as that in the vein. The operator next takes away the thumb of his left hand, with which he steadied the vessel, and allows the blood to escape freely, till the desired quantity is obtained. The arm ought to be kept in the same position while the blood is escaping, lest the skin should slip over the orifice of the vein, keep the blood from getting out, and make it insinuate itself into the cellular substance.

When the blood does not issue freely, however, most surgeons direct the patient to move his fingers or turn something round and round in his hand. This puts the muscles of the arm into action, and the pressure, they then make on the veins, makes the blood circulate more briskly through these vessels.

The proper quantity of blood being discharged, the fillet is to be untied. The flow of blood now generally ceases; though

sometimes, when the orifice is large, and the circulation very vigorous, it still continues. In this circumstance, the operator may immediately stop the bleeding, by placing the thumb of his left hand firmly on the vessel, a little below the puncture.

The blood is next to be all washed off the arm, the sides of the wound placed in contact, and the compresses applied, and secured with the fillet, put round the elbow in the form of a figure of 8, and regularly crossing just over the compresses.

The patient should be advised not to move his arm much, till the fillet is removed, which may be done after twenty-four hours.

In order to open the external jugular vein, the patient's head is to be laid on one side, and properly supported. Then the operator is to press upon the lower part of the vein with his thumb, so as to make the part above swell, and then the lancet is to be pushed at once into the vessel, with the cautions already stated.

There is commonly no difficulty in stopping the bleeding, after the pressure is removed. Some practitioners have directed a scalpel to be used for dividing the integuments, before opening the vein itself; but, this is quite unnecessary.

Blood-letting in the feet is executed on the same principle as in other parts; but, the blood from the veins in this situation, in general not flowing with much celerity, it is customary to immerse the feet in warm water, in order to promote the bleeding.

[The use of the German fleame, or, as it is oftener called, the spring lancet, has in some parts of the United States, almost entirely superseded that of the lancet; it certainly possesses some advantages over the latter, although I am not disposed to deny that it is in some respects inferior. In a country situated like the United States, where every surgeon, except those residing in our largest cities, is compelled to be his own cutler, at least so far as to keep his instruments in order, the spring lancet has a decided preference over the lancet; the blade of this can with great ease be sharpened by any man of common dexterity, and if not very keen it does no mischief, whereas a dull lancet is a most dangerous instrument, and no one can calculate with certainty the depth to which it will enter; to sharpen a lancet, is regarded by the cutler, as one of his nicest and most difficult jobs; it is one to which few surgeons are competent.]

The safety of using the fleame is demonstrated by daily experience; there is

no country in which venesection is more frequently performed than in the United States, and *perhaps no one where fewer accidents from the operation* have occurred, of these few, I beg leave to state, that all the aneurisms produced by bleeding, which I have seen, have been in cases where the lancet was used.

The manner of using the spring lancet differs in nothing from the operation described by Mr. Cooper, excepting that the surgeon must place the instrument in such a situation over the vein, that when the spring is touched, the orifice into the vein will have a proper size and direction. Dexterity in this is very readily and speedily acquired. In point of *facility* in its use it has a great advantage over the lancet.

Among the advantages of the spring lancet *economy* is not the least. A country practitioner, who is constantly employing the English lancets, and who is particular in using none but the best, must necessarily consume half the emolument derived from the operation, in the purchase of his instruments. One spring lancet, with an occasional new blade, will serve him all his life.]

ARTERIOTOMY.

The only arteries from which blood is ever taken in practice, are the trunk and branches of the temporal artery, which lie in such a situation, that they may easily be compressed against the subjacent bones, and the bleeding stopped. When the vessel which the surgeon chooses to open, lies very near the surface, or may be ascertained by feeling, or even seeing, its pulsation, it may be opened at once with a lancet. But, in many instances, it is so deeply situated, that it becomes necessary, in the first place, to make a cut in the skin, and then puncture the vessel.

The bleeding generally stops without any trouble; and may always be suppressed by a compress and bandage. In a very few cases, the blood bursts forth from time to time, and more is lost than is necessary. When this happens, notwithstanding pressure, it is recommended to divide the vessel completely across, which facilitates the process of nature in closing the end of the vessel.

TOPICAL BLEEDING.—CUPPING.

This is done by means of a scarificator, and a glass, shaped somewhat like a bell. The scarificator is an instrument containing a number of lancets, sometimes as many as twenty, which are so contrived,

that when the instrument is applied to any part of the surface of the body, and a spring is pressed, they suddenly start out, and make the necessary punctures. The instrument is also so constructed, that the depth to which the lancets penetrate, may be made greater, or less, at the option of the practitioner. As only small vessels can be thus opened, a very inconsiderable quantity of blood would be discharged, were not some method taken to promote the evacuation. This is commonly done with a cupping-glass, the air within the cavity of which is rarified by the flame of a little lamp, containing spirit of wine, or as some choose, by setting on fire a piece of tow, dipped in this fluid, and put in the cavity of the glass. When the mouth of the glass is placed over the scarifications, and the rarified air in it becomes condensed, as it cools, the glass is forced down on the skin, and a considerable suction takes place.

Trials have been made of syringes, calculated for exhausting the air from cupping-glasses; but the plan is not found so convenient as the one we have described.

When the glass becomes moderately full, and it is desirable to take away more blood, it is best to remove it and put on another one.

A common pledget is usually applied as a dressing for the punctures made with the scarificator.

LEECHES.

Leeches are often preferable to cupping, which is attended with more irritation than many surfaces, in particular circumstances, can bear, especially when the topical bleeding is to be frequently repeated.

Leeches occasionally cannot easily be made to fix on the particular part we wish; but, they will do so, if the place be first cooled with a cloth dipped in cold water, or if it be moistened with cream or milk, and they are confined in the situation with a small glass. When they fall off, the bleeding may be promoted, if necessary, by fomenting the part.

SCARIFICATION WITH A LANCET.

is mostly done in cases of inflamed eyes. An assistant is to raise the upper eye-lid, while the surgeon himself depresses the lower one, and makes a number of slight scarifications, where the vessels seem most turgid, trying particularly to cut the largest completely across.

DRY-CUPPING.

We may here mention this simple operation, performed by rarifying the air in a cupping-glass, as above directed, and then applying the vessel to the part affected. A cupping-glass, furnished with a syringe, might answer for this purpose. I think this operation is now not much used in this country: a proof that it is not a very efficacious measure.

ILL CONSEQUENCES SOMETIMES FOLLOWING
BLEEDING IN THE ARM.1. *Ecchymosis.*

The most common is a thrombus, or ecchymosis, a small tumour around the orifice, and occasioned by the blood insinuating itself into the adjoining cellular substance, at the time when this fluid is flowing out of the vessel. Changing the posture of the arm will frequently hinder the thrombus from increasing in size, so as to obstruct the evacuation of blood. But, in some instances, the tumour suddenly becomes so large, that it entirely interrupts the operation, and prevents it from being finished. In these cases, however, the most effectual method of preventing the tumour from becoming still larger, is to remove the bandage. By allowing the bandage to remain, a very considerable swelling may be induced, and such as might be attended with great trouble. If more blood be required to be taken away, it ought to be drawn from another vein, and, what is still better, from a vein in the other arm.

The best applications for promoting the absorption of these tumours, are those containing spirit, vinegar, or sal ammoniac. Compresses, wetted with any lotion of this sort, may be advantageously put on the swelling, and confined there with a slack bandage.

2. *Inflammation of the Integuments and sub-jacent cellular Substance.*

Mr. Abernethy says, that the inflammation and suppuration of the cellular substance, in which the vein lies, is the most frequent occurrence. On the subsidence of this inflammation, the tube of the vein is free from induration. Sometimes the inflammation is somewhat indolent, producing a circumscribed, and slowly suppurating tumour. Sometimes it is more diffused, and partakes of the erysipelatos nature. On other occasions, the affection is of the phlegmonous kind.

When the lancet has been bad, so as rather to have lacerated, than cut the parts; when the constitution is irritable,

and especially, when care is not taken to unite the edges of the puncture, and the arm is allowed to move about, so as to make the two sides of the wound rub against each other; inflammation will most probably ensue. The treatment of this case consists in keeping the arm perfectly at rest in a sling, applying the saturnine lotion, and giving one or two mild saline purges. When suppuration takes place, a small poultice is the best local application.

3. *Absorbents inflamed.*

Sometimes, particularly when the arm is not kept properly quiet after bleeding, swellings make their appearance about the middle of the arm, over the large vessels, and on the fore-arm, about the mid-space, between the elbow and the wrist, in the integuments covering the flexor muscles. The swelling at the inner edge of the biceps is sometimes as large as an egg. Before such swellings take place, the wound in the vein often inflames, becomes painful and suppurates, but without any perceptible induration of the venal tube, either at this time, or after the subsidence of the inflammation. Pains are felt shooting from the orifice in the lines, up and down the arm, and upon pressing in the course of this pain, its degree is increased. On examining the arm attentively, indurated absorbents may be plainly felt leading to the tumour at the side of the biceps muscle.

The pain and swelling often extend to the axilla, where the glands also sometimes enlarge. Chord-like substances, evidently absorbents, may sometimes be felt, not only leading from the puncture to the swelling in the middle of the arm, but also from this latter situation up to the axillary glands, and from the wound in the vein down to the enlarged glands of the mid-space between the elbow and wrist, over the flexor muscles of the hand.

The enlarged glands very often proceed to suppuration, and the patient suffers febrile symptoms. Some may suspect that the foregoing consequences may arise from the lancet being envenomed, and from the absorption of the virulent matter; but the frequent descent of the disease to the inferior absorbents militates against this supposition.

When the absorbents become inflamed, they quickly communicate the affection to the surrounding cellular substance. These vessels, when indurated, appear like small chords, perhaps of one eighth of an inch in diameter: this substance cannot be the slender sides of the vessels, suddenly increased in bulk, but an induration of the surrounding cellular substance.

The inflammation of the absorbents, in consequence of local injury, is deducible from two causes; one, the absorption of irritating matter; and the other, the effect of the mere irritation of the divided tube. When virulent matter is taken up by the absorbents, it is generally conveyed to the next absorbent gland, where its progress being retarded, its stimulating qualities give rise to inflammation, and, frequently, no evident disease of the vessel, through which it has passed, can be distinguished.

When inflammation of the absorbents happens in consequence of irritation, the part of the vessel nearest the irritating cause, generally suffers most, while the glands, being remotely situated, are not so much inflamed.

The treatment of the preceding case consists in keeping the arm perfectly quiet in a sling, dressing the puncture of the vein with any mild simple salve, covering the situation of the inflamed lymphatics with linen wet with the saturnine lotion, and giving some gentle purging medicine.

When the glandular swellings suppurate, poultices should be applied, and if the matter does not soon spontaneously make its way outward, the surgeon may open the abscess. (See *Mr. Abernethy's Essay on this subject.*)

4. Inflammation of the Vein.

The vein itself is very likely to inflame, when the wound does not unite. This affection will vary in its degree, extent, and progress. One degree of inflammation may only cause a slight thickening of the venal tube, and an adhesion of its sides. Abscesses, more or less extensive, may result from an inflammation of greater violence, and the matter may sometimes become blended with the circulating fluids, and produce dangerous consequences, or the matter may be quite circumscribed, and make its way to the surface. When the vein is extensively inflamed, a good deal of sympathetic fever is likely to ensue, not merely from the excitement, which inflammation usually produces, but also in consequence of the irritation continued along the membranous lining of the vein to the heart. If, however, the excited inflammation should fortunately produce an adhesion of the sides of the vein to each other, at some little distance from the wounded part, this adhesion will form a boundary to the inflammation, and prevent it spreading further. The effect of the adhesive inflammation in preventing the extension of inflammation along membranous surfaces has been ably explained

by Mr. Hunter. In one case, Mr. Hunter applied a compress to the inflamed vein, above the wounded part, and he thought that he thus succeeded in producing an adhesion, as the inflammation was prevented from spreading further. When the inflammation does not continue equally in both directions, but descends along the course of the vein, its extension in the other direction is probably prevented by the adhesion of the sides of the vein to each other. (See *Mr. Hunter's Paper in the Medical and Chirurgical Transactions*, Vol. 1.)

Mr. Abernethy mentions his only having seen three cases, in which an inflammation of the vein succeeded venesection. In neither of these did the vein suppurate. In one, about three inches of the venal tube inflamed both above and below the puncture. The integuments over the vessel were very much swollen, red, and painful, and there was a good deal of fever, with a rapid pulse, and furred tongue. The vein did not swell, when compressed above the diseased part. In another instance, the inflammation of the vein did not extend towards the heart, but only downwards, in which direction it extended as far as the wrist.

The treatment is to lessen the inflammation of the vein, by the same means, which other inflammations require, and to keep the affection from spreading along the membranous lining of the vessel, towards the heart, by placing a compress over the vein, a little way above the puncture, so as to make the opposite sides of the vessel adhere together.

Mr. Abernethy can conceive a case, in which the vein may even suppurate, and a total division of the vessel might be proper, not merely to obviate the extension of the local disease, but to prevent the pus from becoming mixed with the circulation.

Might it not be better to put a ligature under the suppurating vein, above the affected part of the vessel? This plan would be quite effectual, without the objection of hemorrhage.

[We beg leave to recommend in this place, the application of a blister over the puncture as the most valuable remedy for this complaint; it should be applied as early as possible after the discovery of the disease; a blister as large as the palm of the hand will be sufficient, and in a number of instances it has succeeded in removing immediately all the unpleasant symptoms. If the orifice in the vein be not closed, a dossil of lint may be applied over it to defend it from the flies, but commonly this caution is unnecessary.]

5. *Inflammation of the Fascia of the Fore-arm.*

Sometimes, in consequence of the inflammation arising from the wound of the lancet in bleeding, the arm becomes very painful, and can hardly be moved. The puncture often remains unhealed, but, without much inflammation of the surrounding integuments. The fore-arm and fingers cannot be extended without great pain. The integuments are sometimes affected with a kind of erysipelas; being not very painful, when slightly touched, but when forcibly compressed, so as to affect the inferior parts, the patient suffers a good deal. The pain frequently extends towards the axilla and acromion; no swelling, however, being perceptible in either direction. These symptoms are attended with considerable fever. After about a week, a small superficial collection of matter sometimes takes place, a little below the internal condyle: this being opened, a very little pus is discharged, and there is scarcely any diminution of the swelling or pain. Perhaps, after a few days more, a fluctuation of matter is distinguished below the external condyle, and this abscess being opened, a great deal of matter gushes from the wound, the swelling greatly subsides, and the patient's future sufferings are comparatively trivial.

The last opening, however, is often inadequate to the complete discharge of the matter, which is sometimes originally formed beneath the fascia, in the course of the ulna, and its pointing at the upper part of the arm depends on the thinness of the fascia in this situation. The collection of pus descends to the lower part of the detached fascia, and a depending opening for its discharge becomes necessary. This being made, the patient soon gets well.

In these cases, neither the vein, nor the absorbents, appear inflamed. The integuments are not much affected, and the patient complains of a tightness of the fore-arm. Matter does not always form, and the pliability of the arm, after a good while, gradually returns again.

Mr. Watson relates a case, which was followed by a permanent contraction of the fore-arm. Mr. Abernethy is of opinion, that a similar contraction of the fore-arm, from a tense state of the fascia, may be relieved by detaching the fascia from the tendon of the biceps, to which it is naturally connected. Mr. Watson seems to have obtained success in his first case, by having cut this connexion.

The treatment of an inflamed fascia, in consequence of venesection, has in it

no peculiarity. General means for the cure of inflammation should be employed. The limb should be kept quiet, and the inflamed part relaxed. As soon as the inflammation abates, the extension of the fore-arm and fingers ought to be attempted, and daily performed, to obviate the contraction, which might otherwise ensue. (*Abernethy*.)

Mr. Charles Bell objects to calling the affection an inflammation of the fascia, because he sees no proof of this part being inflamed, and he conceives that the symptoms proceed from the inflammation spreading in the cellular membrane, and passing down among the muscles, and under the fascia. The fascia acts as a bandage, and, from the swelling of the parts beneath, it binds the arm, but is not itself inflamed, and contracted. When necessary to divide the fascia, Mr. Charles Bell thinks it would be better to begin an incision near the inner condyle of the humerus, and to continue it some inches down the arm, rather than perform the nice, if not dangerous operation, of cutting the fascia, at the point, where the expansion goes off from the round tendon of the biceps.

When the elbow-joint and fore-arm continue stiff after all inflammation is over, Mr. C. Bell recommends frictions with camphorated mercurial ointment, &c. and the arm to be gradually brought into an extended state by placing a splint on the fore-part of the limb. (*Operative Surgery*, Vol. 1, p. 65.)

6. *Ill Consequences of a wounded Nerve.*

Mr. Abernethy informs us, that Mr. Pott used to mention two cases, in which the patients had suffered distracting pains, followed by convulsions and other symptoms, which could only be ascribed to nervous irritation, arising from a partial division of the nerve, and he recommended its total division, as a probable remedy. Dr. Monro is said to relate similar cases, in which such treatment has proved successful.

Hence, it is highly necessary to know the characteristic symptoms of the case, particularly, as all the foregoing ones would be exasperated by the treatment just now alluded to. It is to Mr. Abernethy that we are indebted for several valuable remarks elucidating this subject. He informs us, that the two cutaneous nerves are those, which are exposed to injury. Most frequently all their branches pass beneath the veins, at the bend of the arm; but, sometimes, although the chief rami go beneath these vessels, many small filaments are detached over them, which

it is impossible to avoid wounding in phlebotomy.

Mr. Abernethy thinks the situation of the median nerve, renders any injury of it very unlikely. If, however, a doubt should be entertained on this subject, an attention to symptoms will soon dispel it. When a nerve is irritated at any part, between its origin and termination, a sensation is felt, as if some injury were done to the parts, which it supplies. If, therefore, the cutaneous nerves were injured, the integuments of the fore-arm would seem to suffer pain; if the median nerve, the thumb, and two next fingers, would be painfully affected.—(Abernethy.)

What are the ills likely to arise from a wounded nerve? If it were partially cut, would it not, like a tendon, or any other substance, unite? It seems probable that it would do so, as nerves, as large as the cutaneous ones of the arm, are very numerous in various situations of the body, and are partially wounded in operations, without any peculiar consequences usually ensuing. The extraordinary pain sometimes experienced in bleeding, may denote that a cutaneous nerve is injured. The situation of the nervous branches is such, that they must often be partially wounded in the operation, though they probably unite again, in almost all cases, without any ill consequences. Yet, says Mr. Abernethy, it is possible, that an inflammation of the nerve may accidentally ensue, which would be aggravated, if the nerve were kept tense, in consequence of its impartial division. Mr. Abernethy thinks the disorder arises from inflammation of the nerve, in common with the other wounded parts. Every one will admit that an inflamed nerve would be very likely to communicate dreadful irritation to the sensorium, and that a cure would be likely to arise from intercepting its communication with that organ.

The general opinion is, that the nerve is only partially divided, and that a complete division would bring relief. Mr. Pott proposed enlarging the original orifice. It is possible, however, that the injured nerve may be under the vein, and, if the nerve be inflamed, even a total division of it, at the affected part, would, perhaps, fail in relieving the general nervous irritation, which the disease has occasioned. To intercept the communication of the inflamed nerve with the sensorium, does, however, promise perfect relief. This object can only be accomplished by making a transverse incision above the orifice of the vein. The incision need not be large, for the injured nerve must lie within the limits of the

original orifice, and it need only descend as low as the fascia of the fore-arm, above which all the filaments of the cutaneous nerves are situated. As the extent of the inflammation of the nerve is uncertain, Mr. Abernethy suggests even making a division of the cutaneous nerve still further from the wound made in bleeding.

Examples are recorded, in which not only extraordinary pain was occasioned by the prick of the lancet; but, erysipelas of the skin seemed to be induced by the operation, ending in gangrene of the whole limb, and the death of the patient. (See *Richerand's Nosographie Chirurgicale*, Tom. 2, p. 390. Edit. 2.)

In former times, it was customary to refer many of the bad symptoms occasionally following venesection, to a puncture of the tendon of the biceps; but, this doctrine is now in a great measure renounced, the experiments of Haller having completely proved, that tendons and aponeuroses are, comparatively speaking, parts ended with little or no sensibility.

In the foregoing account, the various ill consequences occasionally arising, after venesection, are represented separately; no doubt, in some cases, they may occur together.

(See *Essay on the ill Consequences sometimes following Venesection*, by J. Abernethy, *F. R. S. Medical and Chirurgial Transactions*, Vol. I. *Medical Communications*, Vol. II. *Richerand's Nosographie Chirurgicale*, Tom. 2, p. 381. Edit. 2.)

BLEEDING. Effusion of blood from accidental wounds. (See *Hemorrhage*.)

BLE'NORRHAGIA, or *Blénorrhæa*. (from *βλεννος*, mucus, and *ρεῖν*, to flow.)

A discharge of mucus. Swediaur, who maintains, that the gonorrhæa is attended with a mucous, and not a purulent discharge, prefers the name of blenorrhagia for the disease. However, in treating of gonorrhæa, we shall find that this last appellation is itself not altogether free from objections.

BLEPHAROPTOSIS. (from *βλεφαρον*, the eyelid, and *πτωσις*, a falling down.) Called also *ptosis*. An inability to raise the upper eyelid. (See *Ptosis*.)

BLEPHARO'TIS. An inflammation of the eyelids.

BLEPHARO'XYSIS. (from *βλεφαροι*, the eyelid, and *ξεω*, to scrape.) Called also *Ophthalmoxystrium*. A brush for the eye, employed by the ancient surgeons, and made of the beards of barley or rye. It was drawn across the inside of the eyelids, with the same design as scarifications are now made.

BLEPHARO'XYSTON. An ancient instrument for examining the eye. A

speculum oculi. Also, according to Paulus Ægineta, the specillum asperatum, or rasp-like probe.

BLINDNESS. This is an effect of many diseases of the eye. See, particularly, *Amaurosis*; *Cataract*; *Cornea, opacities of*; *Hydrophthalmia*; *Leucoma*; *Ophthalmia*; *Pterygium*; *Pupil, closure of*; *Staphyloma, &c.*

BLISTERS. Topical applications, which, when put on the skin, raise the cuticle in the form of a vesicle, filled with a serous fluid. Various substances produce this effect on the skin; but, the powder of cantharides is what operates with most certainty and expedition, and, is now invariably made use of for the purpose. The blister plaster is thus composed: *R Cantharidum lbj, Emplastri cere lbj. Adipis suillæ præp. lbss.* The wax plaster and lard being melted, and allowed to become nearly cold, the powdered cantharides are afterwards to be added.

When it is not wished to maintain a discharge from the blistered part, it is sufficient to make a puncture in the cuticle to let out the fluid; but, when the case requires keeping up a secretion of pus, the surgeon must remove the whole of the detached cuticle with a pair of scissors, and dress the excoriated surface in a particular manner. Practitioners used formerly to mix powder of cantharides with an ointment, and dress the part with this composition. But, such a dressing not unfrequently occasioned very painful affections of the bladder, a scalding sensation in making water, and very afflictive stranguries. An inflammation of the bladder, ending fatally, has been thus excited. The treatment of such complaints consists in removing every particle of cantharides from the blistered part, making the patient drink abundantly of mucilaginous drinks, giving emulsions, and some doses of camphor.

These objections to the employment of salves, containing cantharides, for dressing blistered surfaces, led to the use of mezereon, euphorbium, and other irritating substances, which, when incorporated with ointment, form very proper compositions for keeping blisters open, without the inconvenience of irritating the bladder, like cantharides.

The favourite application, however, for keeping open blisters, is the powder of savine, which was brought into notice by Mr. Crowther, in the first edition of his book on the White Swelling. In the late edition, this gentleman remarks, that he was led to the trial of different escharotic applications, in the form of ointment, in consequence of the minute attention, which caustic issues demand;

and among other things, he was induced to try powdered savine, from observing its effects in the removal of warts. Some of the powder was first mixed with white cerate, and applied as a dressing to the part, that had been blistered; but, the ointment ran off, leaving the powder dry upon the sore, and no effect was produced. Mr. Crowther next inspissated a decoction of savine, and mixed the extract with the ointment, which succeeded better, for it produced a great and permanent discharge. At last, after various trials, he was led to prefer a preparation analogous to the unguentum sambuci P. L. and he now offers the following formula, as answering every desirable purpose: *R Sabina recentis contusæ lbj. Cera flavæ lbj. Adipis suillæ lbiv. Adipe et cerâ liquefactis, incoque sabinam et cola.*

The difference of this formula from the one, which Mr. Crowther published in 1797, only consists in using a double proportion of the savine leaves. The ceratum sabinæ of Apothecary's Hall, he says, is admirably made: the fresh savine is bruised with half the quantity of lard, which is submitted to the force of an iron press, and the whole is added to the remainder of the lard, which is boiled until the herb begins to crisp; the ointment is then strained off; and the proportion of wax, ordered, being previously melted, is added. On the use of the savine cerate, immediately after the cuticle, raised by the blister, is removed, it should be observed, says Mr. Crowther, that experience has proved the advantage of using the application lowered by a half, or two-thirds, of the unguentum ceræ. An attention to this direction will produce less irritation, and more discharge, than if the savine cerate were used in its full strength. Mr. Crowther says also, that he has found fomenting the part with flannel wrung out of warm water, a more easy, and preferable way of keeping the blistered surface clean, and fit for the impression of the ointment, than scraping the part, as has been directed by others. An occasional dressing of the unguentum resinæ flavæ, he has found, a very useful application for rendering the sore free from an appearance of slough, or rather dense lymph, which has sometimes been so firm in its texture, as to be separated by the probe, with as much readiness, as the cuticle is detached after blistering. As the discharge diminishes, the strength of the savine dressing should be proportionally increased. The ceratum sabinæ must be used, in a stronger, or weaker degree, in proportion to the excitement produced on the patient's skin. Some require a greater sti-

mulus, than others, for the promotion of the discharge, and this can only be managed by the sensations, which the irritation of the cerate occasions.

Mr. Crowther has used ointments, containing the flowers of the elematis recta, the capsicum, and the leaves of the digitalis purpurea. The two first produced no effect; the last was very stimulating; and Mr. Crowther mentions his intention to take the first convenient opportunity to determine its qualities more accurately. He has also used kali purum, rubbed down with spermaceti cerate, in the proportion of one dram to an ounce: it proved very stimulating, but produced no discharge. He has tried one dram of the hydrargyrus muriatus mixed with two ounces of the above cerate; but the application was so intolerably painful, that Mr. Crowther was sent for at the end of two hours, and found it necessary immediately to remove the dressing. The patient was attacked with the most severe pytalism Mr. Crowther ever witnessed. (*Practical Observations on the White Swelling, &c. a new edition, by B. Crowther, 1808.*)

Instead of keeping a blister open, it is frequently a judicious plan to renew the application of the emplastrum lyttæ (the new name now adopted for blistering plaster) after healing up the vesication first produced, and to continue, in this manner, a succession of blisters, at short intervals, as long as the circumstances of the case may demand.

BOIL. See *Furunculus*.

BORBORYGMUS. A rumbling sound, occasioned by air in the intestines.

BO'THRION, or *Bôtrion*. A very small superficial ulcer of the cornæa.

BO'TIA. The disease called Scrofula.

BO'TIUM. A swelling of the thyroid gland. See *Bronchocele*.

BOUGIE. (French for Wax Candle.) This signifies an instrument somewhat resembling a straight piece of wax-taper, and the chief use of which is to remove obstructions in the urethra, by being introduced into this canal. The composition, of which they are made, ought, in particular, to possess a certain degree of suppleness, combined with a good deal of firmness.

Scultetus, a practitioner and writer of great note, at Ulm, in Germany, about the middle of the seventeenth century, was not ignorant of the manner of making and using bougies, in diseases of the urethra, as appears in his *Armentarium Chirurg. tab. 13, fig. 9, 10*. And from his invention, as Mr. Gooch has observed, it is not at all improbable, that

Daran may have taken the hint, and improved upon it.

The making of bougies has now become so distinct a trade, that some surgeons may consider it superfluous to treat of the subject in this dictionary. However, though a surgeon may not actually choose to take the trouble of making bougies himself, he ought certainly to understand how they ought to be made: Swediaur recommends the following composition: \mathfrak{R} Ceræ flavæ lbj. Spermatistis ceti \mathfrak{z} ij. Cerussæ acetatæ \mathfrak{z} v. These articles are to be slowly boiled together, till the mass is of proper consistence. Mr. B. Bell's bougie plaster is thus made: \mathfrak{R} Emplastri lythargyri \mathfrak{z} iv. Ceræ flavæ \mathfrak{z} iss. Olei Olivæ \mathfrak{z} ij. The two last ingredients are to be melted in one vessel, and the litharge plaster in another, before they are mixed. In Wilson's *Pharmacopœia Chirurgica*, I observe this formula: \mathfrak{R} Olei Olivæ lbiss, Ceræ flavæ lbj, Minii lbiss. Boil the ingredients together over a slow fire, till the minium is dissolved, which will be in about four or six hours. The composition for bougies, is now very simple, as modern surgeons place no confidence in the medicated substances, formerly extolled so much by the famous Daran. The linen, which may be considered as the basis of the bougie, is impregnated with the composition alluded to, and which we see is generally made of wax and oil, rendered somewhat firmer by a proportion of resin. Some saturnine preparation is commonly added, as the urethra is in an irritable state, and the mechanical irritation might otherwise increase it. Of whatever composition bougies are made, they must be of different sizes, from that of a knitting needle to that of a large quill, and even larger. The common ones are made in the following manner. Having spread any composition, chosen for the purpose, on linen rag, cut this into slips, from six to ten inches long, and from half an inch, to an inch, or more in breadth. Then dexterously roll them on a glazed tile into the proper cylindrical form. As the end of the bougie, which is first introduced into the urethra, should be somewhat smaller than the rest, the slips must be cut rather narrower in this situation, and, when the bougies are rolled up, that side must be outward, on which the plaster is spread.

Mons. Daran, and some others, attributed the action of their bougies to the composition used in forming them. Mr. Sharp apprehended that their efficacy was chiefly owing to the pressure, which they made on the affected part; and Mr.

Aikin adds, that as bougies of very different compositions succeed equally well in curing the same diseases in the urethra, it is plain, that they do not act from any peculiar qualities in their composition, but by means of some common property, probably, their mechanical form.

There certainly is a great objection to making bougies of very active materials; because the healthy, as well as the diseased, parts are exposed to their action. Hence, surgeons now prefer the common bougies, made of a simple unirritating composition.

Plenck recommended bougies of catgut, which may be easily introduced even into a urethra, greatly contracted, as their size is small, their substance firm, and they dilate with moisture. It is objected to catgut, however, that it dilates very much beyond the stricture, and gives great pain on being withdrawn.

The elastic resin has been employed for this purpose with great success, as it unites firmness and flexibility. The resin is moulded on catgut by some secret method. Mr. Wilson, in this *Pharmacopœia Chirurgica*, seems to suggest, with much appearance of probability, that the secret consists in finding a suitable solvent for the Indian gum. As this substance, if dissolved in æther, completely recovers its former elasticity, upon the evaporation of this fluid, it is supposed that æther would answer the purpose, though rather too expensive. The catgut is coated with the elastic matter by being repeatedly dipped in it. Elastic gum bougies are in many cases highly serviceable, though their surface soon becomes rough, and they are expensive.

Mr. Smith, apothecary, of Tavistock-street, has discovered a metallic composition, of which he forms bougies, to which some practitioners impute very superior qualities. These bougies are flexible, have a highly polished surface, of a silver hue, and possess a sufficient degree of firmness for any force, necessary in introducing them for the cure of strictures in the urethra. The advocates for the metallic bougies assert, that the short time they have been employed has convinced them, that such instruments exceed any bougies, which have yet been invented, and are capable of succeeding in all cases, in which the use of a bougie is proper. They are made either solid, or hollow, and answer extremely well as catheters; for, they not only pass into the bladder with ease, but may also be continued there for any convenient space of time, and hence produce the most essential benefit. The bougies certainly do not swell with moisture. The greatest

objection, which has been urged against them, is, that they are attended with a risk of breaking. I have heard of an eminent surgeon being called upon to cut into the bladder, in consequence of a metallic bougie having broken, and a piece of it got into that organ, where it became a cause of the severe symptoms, which are commonly the effect of a stone in the bladder. It has also been objected to metallic bougies, that, although they are sufficiently flexible, they are quite destitute of elasticity.

See Sharp's *Critical Enquiry*, ch. 4. Aikin on the external use of Lead. Bell's *Surgery*, Vol. 2. 20, &c. White's *Surgery*, 371.

The bougie, with its application, says Mr. Hunter, is perhaps one of the greatest improvements in surgery, which these last thirty, or forty years have produced. When I compare the practice of the present day, with what it was in the year 1750, I can scarcely be persuaded, that I am treating the same disease. I remember, when, about that time, I was attending the first hospitals in the city, the common bougies were, either a piece of lead, or a small wax candle, and, although the present bougie was known then, the due preference was not given to it, nor its particular merit understood, as we may see from the publications of that time.

Daran was the first, who improved the bougie, and brought it into general use. He wrote professedly on the diseases for which it is a cure, and also of the manner of preparing it; but, he has introduced so much absurdity in his descriptions of the diseases, the modes of treatment, and of the powers and composition of his bougies, as to create disgust.

When Daran published his observations on the bougie, every surgeon set to work to discover the composition, and each conceived, that he had found it out, from the bougies, which he had made, producing the effects described by Daran. It never occurred to them, that any extraneous body, of the same shape and consistence, would do the same thing.

[The following description of the mode of preparing bougies, is taken from the *Elements of Surgery*.

"In this country it is essential for the surgeon to be acquainted with the manner of preparing bougies, because those which are imported and manufactured for sale are very unsafe, and are totally unfit for the purpose for which they are designed. They are unsafe because being formed generally of old linen they are apt to break, and in this manner may lodge in the bladder or urethra, and occasion great inconvenience, and they are

unfit for use, from their bad form, and from the improper substances of which they are composed.

The best materials for the construction of bougies are fine new linen and pure yellow bees wax. The linen should be cut into pieces about twelve or fourteen inches square, and dipped into melted wax; it should be taken out in such a manner that the wax may drip off at one end, and not more by one corner than another; in this manner the linen will receive a coat of wax of a uniform degree of thickness, excepting that the depending portion will be more thickly coated than the superior part; the linen is to be cut into strips of a proper width, care being taken always to cut in the transverse direction, because as there is more wax upon the lower than the upper part, there would be an irregularity in the form of the instrument if this caution were neglected. The strip of waxed linen or bougie plaster is next to be cut of a proper shape, so that when rolled up it may taper to a point. The form which I prefer, is to have the bougie slightly conical, through its whole length, but to taper at the end, very quickly to a point. The smallness of the point enables the surgeon to insinuate it into the stricture, and the conical form gives it a degree of firmness gradually increasing from the point to the opposite extremity. The art of rolling up the bougie and of giving it a proper point is to be acquired by habit, and need not be particularly described. I will only remark, that a marble slab, or a polished mahogany table, and a broad spatula, or knife, are all the tools necessary for this purpose, and I conclude this part of the subject by recommending to the practitioners of this country the preparation of their own bougies.]

(*Treatise on the Venereal Disease*, p. 116, by John Hunter, 1788.)

Of armed bougies, and of the manner of using bougies in general, we shall speak in the article *Urethra, Strictures of*.

BRACHERIUM. A truss or bandage for hernia. A word used by the barbarous Latin writers, and said to be derived from *brachiale*, a bracelet.

BRAIN. (For concussion, compression of, &c. see *Head, Injuries of*; for the hernia of, see *Hernia Cerebri*.)

BREAST. (See *Mammary Abscess; Mamma, Removal of; Cancer, &c.*)

BRONCHOCELE. (from *βρογχος*, the windpipe, and *κλη*, a tumour.) Also called *botium*, or *bocium*. The Swiss call the disease *gotre*. Some have called it, *hernia gutturis*, *guttur tumidum*, and *tracheolophyma*, *gossium*, *excechebronchos*; *gongrona*,

hernia bronchialis. Heister thought it should be named *trachecele*. Prosser, in his late publication on this disorder, from its frequency on the hilly parts of Derbyshire, calls it, with others, the *Derbyshire neck*; and, not satisfied respecting the similitude of this tumour to that observed on the necks of women on the Alps, the *English Bronchocele*.

Modern surgeons constantly mean by *bronchocele*, an enlargement of the thyroid gland. This sometimes attains such a magnitude, that it not only occupies all the space from one angle of the jaw to the other, but also, forms a considerable projection on each side of the neck, advancing forward a good way beyond the chin, and forming an enormous mass, which hangs down over the chest. The swelling, which is more or less unequal, is commonly not particularly hard, especially when the disease is not in a very advanced state; however, no fluctuation is perceptible, and the patients suffer no pain. The skin retains nearly its ordinary colour; but, when the tumour is of very long standing, and great size, the veins of the neck become more or less varicose.

According to Prosser, the tumour generally begins between the eighth and twelfth year. It enlarges slowly during a few years, till, at last, it augments rather rapidly, and forms a bulky pendulous tumour. Women are far more subject to the disease, than men, and the tumour is observed to be particularly apt to increase rapidly during their confinement in childbed. When only one lobe of the thyroid gland is affected, it may extend in front of the carotid artery, and be lifted up by each diastole of this vessel, so as to appear to have the pulsatory motion of an aneurism. (*A. Burns' Surgical Anatomy of the Head and Neck*, p. 195, and *Parisian Chirurgical Journal*, Vol. 2, p. 292, 293.)

It is this disease, to which the term *gotre*, or *goitre*, has been particularly applied, and which is so common in some of the vallies of the Alps. Indeed, there are certain places, where the disease is so frequent, that hardly an individual is totally exempt from it. Larrey, in travelling through the valley of Maurienne, noticed, that almost all the inhabitants were affected with goitres, of different sizes, by which tumours, the countenance was deformed, and the features rendered hideous. (*Mémoires de Chirurgie Militaire*, Tom. 1. p. 123.) In many, the swelling is so enormous, that it is impossible to conceal it by any sort of cloathing. A state of idiotism is another affliction, which is sometimes combined with the

goitre, in countries, where the latter affection is endemic. However, all, who have the disease, are not idiots, or cretins as they have been called, and in Switzerland, and elsewhere, it is met with in persons who possess the most perfect intellectual faculties. Where bronchocele and cretinism exist together, Foderé, and several other writers ascribe the affection of the mind to the state of the thyroid gland. (See *Essai sur le Goitre et Cretinisme*, par M. Foderé.) This opinion, however, appears to want foundation, since the mental faculties are from birth weak, and, in many, the idiotism is complete, where there is no enlargement of the thyroid gland, or where the tumour is not bigger than a walnut, so that no impediment can exist to the circulation to, or from the brain. (*Burns on the Surgical Anatomy of the Head and Neck*, p. 192.) The direct testimony of Dr. Reeve also proves, that, in the countries, where cretins are numerous, many people of sound and vigorous minds have bronchocele. (See *Dr. Reeve's Paper on Cretinism*, *Edinb. Med. and Surgical Journal*, Vol. 5, p. 31.) Hence, as Mr. A. Burns has remarked, the combination of bronchocele and cretinism must be considered as accidental; a truth, that seems to derive confirmation from the fact, that, in some parts of this country, bronchocele is frequent, where cretinism is seldom or never seen. The bronchocele seems to be endemic in several mountainous countries, particular Switzerland, Savoy, Tyrol, Derbyshire, &c. and it occurs remarkably often in young subjects, and much more frequently in the female, than the male sex. In women, it usually makes its appearance at an early age, generally between the eighth and twelfth year, and it continues to increase gradually for three, four, or five years, and is said sometimes to enlarge more, during the last half year, than for a year, or two, before. It does not generally rise so high as the ears, as in the cases mentioned by Wiseman, and it is rather in a pendulous form, not unlike, as Albucasis says, the flap, or dewlap of a turkey-cock, the bottom being the largest part of the tumour. It is soft, or rather flabby to the touch, and somewhat moveable, but, after a few years, when it has ceased enlarging, it becomes firmer, and more fixed. When the disease is very large, it generally occasions a difficulty of breathing, which is increased on the patient's catching cold, or attempting to run. In some subjects, the tumour is so large, and affects the breathing so much, that a loud wheezing is occasioned; but, there are many exceptions to this remark. Sometimes,

when the swelling is of great size, patients suffer very little inconvenience; while others are greatly incommoded, though the tumour is small. In general, the inconvenience is trivial. The voice is occasionally rendered hoarse. In some instances, only one lobe of the thyroid gland is affected.

The causes of the bronchocele are little known. To the opinion, that bronchocele is caused by the earthy impregnation of water used for drink, the following objections offer themselves. 1. The water of Derbyshire, in districts, where this disease is considered endemic, contains much supercarbonate of lime; but that in common use about Nottingham, where the disease is also prevalent, is impregnated with sulphate of lime. 2. Abstinence from water unboiled does not diminish, nor interrupt the gradual progress of the disease. 3. Patients are cured of the disease, who still continue to drink water from the same source as before, without taking any precaution, as boiling, &c. 4. The disease is seldom found among men. 5. Many instances may be related of a swelling in the neck, sometimes very painful, and generally termed bronchocele, being produced very suddenly, by difficult parturition, violent coughing, or any other unusually powerful effort. (See *Edinb. Med. and Surgical Journal*, Vol. 4, p. 279.) The disease is sometimes seen in scrofulous subjects; but, it may be quite independent of the other disorder. On the mountainous part of Derbyshire, Genoa, and Piedmont, they attribute the bronchocele to drinking water cooled with ice. To this theory, many of the objections, concerning the earthy impregnation of water, stand in full force; with this additional reflection, that, "In Greenland, where snow water is commonly used, these unsightly protuberances are never met with, nor, (says Watson) did I ever see one of them in Westmoreland, where we have higher mountains, and more snow, than they have in Derbyshire, in which county, they are very common. But what puts the matter beyond a doubt, is, that these wens are common in Sumatra, where there is no snow, during any part of the year" (*Watson's Chemical Essays*, Vol. 2, p. 157.)

Respecting the influence of particular water in bringing on the disease, Dr. Odier, the well informed professor of medicine, at Geneva, seems to give credit to the opinion, because, it has appeared to him, that distilled water prevented the increase of the tumour, and even tended to lessen its bulk. (See *Manuel de Médecine Pratique*.) However,

without denying this power of distilled water, I think the foregoing consideration satisfactorily proves, that the disease neither proceeds from snow water nor water impregnated with particular salts.

An observation lately made by an intelligent writer, would lead one to conclude, that cretinism depends upon malformation of the head. Speaking of goitre, as it appears among the inhabitants of the valley of Maurienne, M. Larry informs us, that, in many of these people, with this frightful deformity is joined that of the cranium, of which the smallness and excessive thickness are especially remarkable. (*Mémoires de Chirurgie Militaire*, Tom. 1, p. 123.) Dr. Leake thinks, that tumours of this sort, may be owing to the severity of the cold damp air, as they generally appear in winter, and hardly ever in the warm dry climates of Italy and Portugal. Mr. Prosser is inclined to consider the bronchocele, as a kind of dropsy of the thyroid gland, similar to the dropsy of the ovary, and he mentions, that Dr. Hunter dissected one thyroid gland, which had been considerably enlarged, and contained many cysts filled with water. These, he erroneously concludes, must have been hydatids. Dr. Baillie remarks, that when a section is made of the thyroid gland, affected with this disease, the part is found to consist of a number of cells, containing a transparent viscid fluid.

The ordinary bronchocele is, in all probability, entirely a local disease, patients usually finding themselves, in other respects, perfectly well. The tumour itself frequently occasions no particular inconvenience, only deformity. There is no malignancy in the disease, and the swelling is not prone to inflame, or suppurate, though, as Dr. Hunter remarks, abscesses do occasionally form in it. Bronchoceles never become cancerous. Mr. Gooch never knew life to be endangered by this sort of tumour, however large; but, he saw great inconvenience arise from it, when combined with quinsy. Dr. Hunter says, that the bronchocele appears two, or three years before, or after the commencement of menstruation, and that it sometimes spontaneously disappears, when this evacuation goes on in a regular manner. Mr. Prosser thinks, that this change in the constitution hardly ever affects the tumour.

It is a curious fact, that the inhabitants of the valleys of the Alps are particularly liable to bronchocele, while those, who live in higher situations on the mountains, escape the disease.

TREATMENT OF BRONCHOCELE.

A blister, kept open, has put a stop to the growth of the tumour; but, this method is not much followed at present, as a better plan of treatment has been discovered. The most famous mode of curing the bronchocele is by giving internally burnt sponge, and occasionally, a calomel purge, at the same time, employing frictions to the tumour itself.

The efficacy of burnt sponge is said to be most conspicuous, when this medicine is exhibited in the form of a lozenge, composed of ten grains of this substance, ten of burnt cork, and the same quantity of pumice-stone. These powders are to be made into the proper form with a little syrup, and the lozenge is then to be put under the tongue and allowed to dissolve there. To the latter circumstance, much importance is attached. Other practitioners give a scruple of the burnt sponge alone, thrice every day, while some add a grain of calomel to each dose. A purge of calomel should be ordered about once a week, or fortnight, as long as the patient perseveres in the use of the calcined sponge; but, if mercury be combined with each dose of this medicine, no occasional purgative will be requisite.

External means may very materially assist the above internal remedies. Frequently rubbing the swelling with a dry towel; bathing the part with cold water; rubbing the tumour two, or three times a day, with the aq. ammon. acet. or the camphor liniment; are the best steps of this kind which the surgeon can take.

"In the treatment of bronchocele," says Mr. A. Burns, "repeated topical detraction of blood from the tumour is highly beneficial. Electricity also has sometimes a marked effect; but, there is no remedy, which I would more strongly advise, than regular and long continued friction over the tumour. By perseverance in this plan, a bronchocele, treated in London, was materially reduced in the course of six weeks. Its good effects I have likewise witnessed myself; and it is a remedy highly recommended by Girard in his *Traité des Loupes*." It has also been much used in scrofulous tumours by Mr. Grosvenor of Oxford, and by Mr. Russel of Edinburgh." (*Surgical Anatomy of the Head and Neck*, p. 204.)

Mr. A. Burns recommends the friction to be made with flannel, covered with hair powder, and the part to be rubbed, at least, three times a day, for twenty minutes.

In two cases of bronchocele, related by

Dr. Clarke, the patients were cured, by "the steady use of the compound plaster of ammoniac and mercury, conjoined with the internal exhibition of the burnt sponge, and occasional purgatives." (See *Edinb. Med and Surgical Journal*, Vol. 4, p. 289.)

We learn from Professor Odier, that, in Geneva, the bronchocele is cured by burnt sponge, exhibited in powder, or infused in wine, and combined with purgatives to prevent the cramps of the stomach, which sometimes accompany the disappearance of the swelling. Muriate of barytes has likewise been recommended. (See *Manuel de Médecine Pratique*.)

A whole volume might be written on the various remedies, and plans of treatment, of the bronchocele. The limits of this work, however, demand more conciseness, and, having detailed the most approved practice, we shall be very brief on other proposals.

Mr. Wilmer, ridiculously imputing great influence to the changes of the moon, used to begin with an emetic, the day after the full moon, and to give a purge the day after that. The night following, and seven nights successively, he directed the above-mentioned lozenge to be put under the tongue at bed-time, and administered every noon a bitter stomachic powder. On the eighth day, the purge was to be repeated, and, in the wane of the succeeding moon, the whole process, except the emetic, was renewed. (*Cases in Surgery, Appendix*.) This famous Coventry plan of treatment is said to be greatly assisted, by rubbing the tumour, with an ointment, containing tartar emetic.

Mr. Prosser succeeded with his medicines, though the patient was nearly twenty-five years old, and the swelling had existed more than twelve years. It is said, that no instance of cure has been known, after the patient was twenty-five.

Mr. Prosser orders one of the following powders to be taken early in the morning, an hour, or two after breakfast, and at five, or six o'clock in the evening, every day, for a fortnight, or three weeks. The powder may be taken in a little syrup, or sugar and water, or any thing else, so that none may be lost.

℞ Cinnab. ant. op. levigat. milleped. ppt. et pulv. a a gr. xv. Spong. calcin. ʒ M.

These powders should be taken for two, or three weeks, and left off for a week or nine days, before a repetition. At bed-time, every night, during the second course of the powders, some purgative pills, composed of mercury, the extractum colocynthis. comp. and rhubarb, are to be administered. In general it will be proper

to purge the patient with manna, or salts, before beginning with the powders. Mr. Prosser puts no faith in external applications.

Some have recommended giving two scruples of calcined egg-shells, every morning, in a glass of red wine; half a dram of the kali sulphuratum, every day, dissolved in water; or ten, or fifteen drops of the *tinct. digit. purpur* twice a day, the dose to be gradually increased. Muriated barytes; cicuta; and belladonna, have also been exhibited.

Attempts have been made to extirpate the enlarged thyroid gland; but, the numerous large arteries distributed to this part, the dilated state of these vessels, when the gland is much enlarged, and the vicinity of the carotid arteries, render this operation exceedingly dangerous, especially when the swelling is very large, the only instance, in which a patient would submit to this mode of cure. In doing it, one would be obliged to cut arteries large enough to pour forth a vast quantity of blood in a very short time, and so situated, that it would be difficult to tie, or effectually compress them. Mr. Gooch relates two cases, which do not encourage practitioners to have recourse to the excision of enlarged thyroid glands. In one of these instances, so copious an hemorrhage took place, that the surgeon, though equally bold and experienced, was obliged to stop in the middle of the operation. No means availed in entirely suppressing the bleeding, and the patient in a few days died. In the other example, the same event nearly took place, the patient's life only being saved by compressing the wounded vessels with the hand, day and night for a whole week, by persons who relieved each other in turn. The surgeon found this the only way of stopping the hemorrhage, after many fruitless attempts to tie the vessels.

Certainly these cases are well calculated to deter prudent men from undertaking the hazardous operation of cutting out an enlarged thyroid gland. The practice is the less proper for imitation, for, inconvenient as a bronchocele may be, it scarcely ever endangers life.

It must be noticed, however, that there are a very few cases of enormous bronchoceles, every now and then occurring, which obstruct respiration, deglutition, and the return of the blood from the head, in so serious a degree, that every enterprising surgeon would feel greatly inclined to make any rational attempt to relieve his patient, even though it might be one of a bold description. In such pressing circumstances, a good operator, well acquainted with the anatomy of the

neck, would be warranted in attempting the extirpation of the swelling, and he would be most likely to succeed by imitating the plan, which was followed by Desault, and which I shall hereafter particularly relate. (See *Thyroid Gland, Extirpation of*)

Were a surgeon to be afraid of this attempt, and, were the symptoms urgent, he might adopt another line of conduct, which is, in every respect, rational and warrantable; namely, he might expose, and tie, the superior thyroideal arteries, just as is done in cases of aneurisms. When the quantity of blood, flowing into a tumour, is, suddenly and greatly, lessened, the size of the swelling commonly very soon undergoes a considerable diminution. This operation has been actually practised by Sir William Blizard, who tied the arteries of an enlarged thyroid gland, and, in a week, the tumour was reduced one-third in its size. The ligatures then sloughed off; repeated bleeding took place from the arteries, and by the extension of the hospital gangrene, the carotid itself was exposed. The patient died; yet, as Mr. A. Burns maintains, this does not militate against a repetition of the experiment; the same thing might have happened from merely opening a vein, and, in the confined air of an hospital, has actually happened. (*Surgical Anatomy of the Head and Neck*, p. 202.) For my own part, I am decidedly of opinion, that the great decrease in the size of the gland before death, is a sufficient encouragement to repeat the trial, particularly, as the mode of tying arteries is now brought to the greatest perfection. If the femoral, and even the external iliac, arteries will heal, when tied in Mr. Abernethy's method, there can be no doubt, that the superior thyroideal is capable of doing so.

Recent bronchoceles may often be cured by proper medicines and applications; inveterate ones may generally be diminished, but they hardly ever can be entirely removed.

It is somewhat extraordinary, that, notwithstanding there are so many recorded instances of the bronchocele being cured, Richerand, in his late work, should have set down the disease as totally incurable, either by external applications, or internal medicines. (See his *Nosographie Chirurgicale*, Tom 4, p. 149, Edit. 2.)

Albucasis gave the first good account of the bronchocele. His remarks are translated in Friend's Hist. of Physic, and James's Med. Dic. (See also *Turner's Surgery*, Vol. 1, p. 164, *Wilmer's Cases and Remarks in Surgery*. Prosser on *Bronchocele*, Edit. 3. *Bell's Surgery*, Vol. 5.

White's Surgery. Memoirs of the Med. Society of London, 217. *Gooch's Chirurgical Works*, Vol. 2, p. 96—Vol. 3, p. 157. *Desault's Parisian Chirurgical Journal*, Vol. 2, p. 292. *Œuvres Chirurgicales de Desault*, par Bichat. Tom. 2, p. 98. *Edinb. Med. and Surgical Journal*, Vol. 4, p. 279. *Odi-er's Manuel de Médecine Pratique*. Dr. *Reeves's Paper on Cretinism*, in *Edinb. Med. and Surgical Journal*, Vol. 5. *Essai sur le Goitre et Cretinisme*, par M. Fodéré.—*Richter's Anfangsgründe der Wundarznei-kunst*, Band. 4. *Zweyter Auflage*, Kap. 13, *Vom Kropfe*. *Surgical Anatomy of the Head and Neck*, by A. Burns, p. 191, &c. *Larrey, Memoires de Chirurgie Militaire*, Tom. 1, p. 123, Tom. 3, p. 199, &c.)

BRONCHOTOMY. (from *βρογχος*, the windpipe, and *τεμνω*, to cut.) This is an operation, by which an opening is made into the larynx, or trachea, either for the purpose of making a passage for the air into, and out of, the lungs, when any disease prevents the patient from breathing through the mouth and nostrils; or of extracting foreign bodies, which have accidentally fallen into the trachea; or, lastly, in order to be able to inflate the lungs in cases of sudden suffocation, drowning, &c.

The operation is also named *tracheotomy*, or *laryngotomy*. Its practicableness, and little danger, are founded on the facility, with which certain wounds of the windpipe, even of the most complicated kind, have been healed, without leaving any ill effects whatever, and on the nature of the parts cut, which are not furnished with any vessel of consequence.

This operation is proper in several cases, and requires being differently practised, according to a variety of circumstances. It is not at all a dangerous proceeding, *dummodo* (says Fabricius ab Aquapendente) *qui secat sit anatomes peritus, quia sub hoc medico et artifice, omnia tutissimè et felicissimè peraguntur*.

1. Bronchotomy, we have said, is occasionally performed, to enable the patient to breathe, when respiration through the mouth and nostrils, is impeded by disease.

Quinsy is an affection sometimes creating a necessity for the operation; but, of all those cases which Boerhaave has described, and of which his learned commentator has said so much, there is only that, which is named *strangulans*, for which bronchotomy is indispensable. This species of quinsy presents no visible symptom, neither in the throat nor the pharynx. The examination of the dead subject proves, that the disease is situated in the *œdges* of the rima glottidis, which

opening becomes so contracted as scarcely to leave the smallest space. For this reason, and on account of the tension of the ligaments of the glottis, the voice is rendered excessively acute, and hissing as it were. The suffocation is imminent; the lungs not being expanded, the blood accumulates in these organs, and there is an impediment to the return of the blood from the head through the jugular veins. Hence, a plethoric state of the brain is occasioned. Considering all these circumstances, some have inferred that many of the patients, who have thus perished, might have been saved by making a timely opening into the trachea. All writers, who have treated of bronchotomy in cases of quinsy, have invariably regarded this operation as the ultimate resource. Both the Greeks and Arabians were of this sentiment. In such cases, Avicenna only recommends bronchotomy in violent quinseys, when, medicines have failed, and the patient must evidently die from the unrelieved state of the affection. Rhases also advised the operation only when the patient was threatened with death. Thus we see, that bronchotomy, which might be proper in regard to the object intended, became hurtful from the way, in which it was executed.

It was doubtless in consequence of the ill-success of the operation, that Paulus Ægineta observed: *In synanchicis quidem chirurgiam improbamus, cum inutilis sit præcisio*. Bronchotomy, says M. Louis, will always be done too late, when only allowed as an extreme measure. The danger of perishing by suffocation, in cases of quinsy, M. Louis remarks, has been known from the very dawn of medicine. The advice of Hippocrates, to remedy this urgent symptom, is a proof of it, and, he observes, that the danger is evinced when the eyes are affected and prominent, as in persons who have been strangled, when the face, the throat, and neck burn, without any thing appearing to be wrong on inspection. He recommends *fistulæ in fauces ad maxillas intrudende, quo spiritus in pulmonem trahatur*. No doubt, he would have advised more, had it not been for the doctrine of his time, that the wounds of cartilages were incurable.

This method, defective as it was, continued till Asclepiades, to whom we owe the invention of bronchotomy, if we may believe Galen. Since Asclepiades, this operation has always been recommended, and practised in cases of quinsy, threatening suffocation, notwithstanding the imputation of Cælius Aurelianus, who treated it as fabulous. The mode of doing it, however, has not been well detailed by any who put it in practice, except by

Paulus Ægineta, who is very precise and clear. "We must (says he) make the incision in the trachea, under the larynx, about the third or fourth ring. This situation is the most eligible, because it is not covered with any muscle, and no vessels are near it. The patient's head must be kept backward, in order that the trachea may project more forward. A transverse cut is to be made between two of the rings, so as not to wound the cartilage, only the membrane." The knowledge of this method, and its advantages in cases of the *angina strangulans*, when practised in time, ought, according to M. Louis, to have rendered its performance a general practice.

The convulsive angina of Boerhaave, which particularly affects those, who can only breathe well in an upright posture, had also been adduced as a case demanding the prompt performance of bronchotomy. Mead, in his *Præcepta et Axioma Medica*, relates a case. The patient had been bled very copiously twice in the space of six hours, but he died notwithstanding this large evacuation. The same author took notice in Wales, especially, on the sea coast, of an epidemic catarrhal quinsy, which carried the patients off in two or three days. In these instances, bleeding was not of much use, and bronchotomy, which was not performed, was the only means of saving the patients.

The practitioners of the present day are generally less sanguine in their expectation of benefit, in cases of angina and croup, than M. Louis was. From the observations of Dr. Cheyne, it would appear, that, in croup, the operation cannot be necessary for the purpose of admitting air into the trachea; for, in those, who have died of the disease, he has found a pervious canal, of two-eighths of an inch in diameter, and through a tube of such diameter, even an adult can support respiration for a considerable time. According to the same writer, bronchotomy is equally unfitted for the removal of the membrane formed by the effusion of lymph; for, from its extent, variable tenacity, and adhesions, this is, in almost every case, totally impracticable; and even could the whole membrane be removed, still the function of respiration would be but little improved, the ramifications of the trachea and bronchial cells remaining obstructed (See *Cheyne's Pathology of the Larynx and Bronchia*.)

M. Pelletan joins the best modern writers, in representing the bronchotomy as generally useless in cases of croup: the only example, in which he thinks the operation might be serviceable, is where the disease is confined to the larynx, a case,

which seems to be very uncommon, and difficult to distinguish. "*En supposant enfin l'angine avec concrétion bien caractérisée, on se trouvera encore entre la crainte de pratiquer une opération inutile, si les concrétions se prolongent jusque dans les bronches, et l'impossibilité de juger si ces concrétions sont bornées au larynx. C'est en effet dans ce seul cas que l'opération peut être fructueuse; elle facilitera la respiration pendant que la nature, aidée de l'art, travaillera à dissoudre, détacher, et faire expectorer les fausses membranes qui oblitérent la glotte et le larynx.*" (*Clinique Chirurgicale*, l'om. 1, p. 28.)

Dr. Baillie has recently published three cases, in which death was produced in a adult subject, and, in a very few days, by a violent inflammation of the larynx and trachea. The disease had a strong resemblance to croup; but, yet was different from it. There was not the same kind of ringing sound of the voice as in croup, and no layer of coagulable lymph was formed upon the surface of the inner membrane of the larynx and trachea, which, according to Dr. Baillie, uniformly attends the latter disease. In one of these cases, the cavity of the glottis was found to be almost obliterated, by the thickening of the inner membrane of the larynx at that part. The inner membrane of the trachea was likewise inflamed; but, in a less degree. The lungs were sound. If, in thirty hours, no relief should be derived from bleeding ad deliquium, and the exhibition of opiates, Dr. Baillie conceives, that, in this sort of case, it might be advisable to perform the operation of bronchotomy at the upper part of the trachea, just under the thyroid gland. This operation, he thinks, would probably enable the patient to breathe, till the inflammation in the larynx, more especially, at the aperture of the glottis, had time to subside. (See *Transactions of a Society for the Improvement of Med. and Chirurgic. Knowledge*, Vol 3, p. 275—289.)

The compression of the trachea by foreign bodies, lodged in the pharynx, or by tumours, formed outwardly, and of sufficient size to compress the wind-pipe, is an equal reason for operating, more or less expeditiously, according to the symptoms. Mr. B. Bell mentions two instances of suffocation from bodies falling into the pharynx. Respiration was only stopped for a few minutes; but, the cases were equally fatal, notwithstanding the employment of all the usual means. This author thinks, there was every reason to believe, that bronchotomy would have been attended with the greatest success, if it had been performed in time, before the effects of the suffocation had become

mortal. The operation should also be done, when the trachea is compressed by tumours. The author of the article *Bronchotomie*, in l'*Encyclopédie Méthodique*, says, that about twenty years ago, he opened a man, who had died of an emphysema, which came on instantaneously. He had had, for a long while, a bronchocele which was of an enormous magnitude towards the end of his life. The cavity of the trachea was so obliterated, that there was scarcely room enough to admit the thickness of a small piece of money. Doubtless, bronchotomy, performed before the emphysema made its appearance, would have prolonged this man's days.

In cases of this last description, Desault would have advised the introduction of an elastic gum catheter into the trachea from the nose, in order to facilitate respiration. This practice, I believe, has not hitherto been attempted by English surgeons, though it has been repeatedly tried in France. (See *Œuvres Chirurgicales de Desault*, par Bichat, Tom. 2, p. 236, &c.)

M. Habicot, in a treatise, intitled, *Question Chirurgicale sur la Possibilité et la Nécessité de la Bronchotomie*, mentions his having successfully performed this operation on a lad fourteen years old, who, having heard it said, that gold, when swallowed, did no harm, attempted to swallow nine pistoles, wrapped up in a piece of cloth to hide them from thieves. The packet, which was very large, could not pass the narrow part of the pharynx; and here it lodged, so that it could neither be extracted, nor forced down into the stomach. The boy was on the point of being suffocated by the pressure, which the foreign body made on the trachea; and his neck and face were so swollen and black, that he could not have been known. M. Habicot, to whose house the patient was brought, attempted in vain, by different means, to dislodge the foreign body. At length, perceiving the patient in evident danger of being suffocated, he resolved to perform bronchotomy. This operation was no sooner done, than the swelling and lividity of the face and neck disappeared. M. Habicot pushed the pieces of gold down into the stomach with a leaden probe, and the pistoles were, at different times, discharged from the anus, eight or ten days afterwards. The wound of the trachea very soon became quite well. (See *Mem. de l'Acad. de Chirurgie*, Tom. 12, p. 243. Edit. in 12mo.)

In such a case, Desault would have introduced an elastic gum catheter into the larynx, instead of performing bronchotomy, which would not answer, were the foreign body low down. (See *Œuvres Chirurg. de Desault*, Tom. 2, p. 247.)

2. We have said, that foreign bodies in the trachea, may render it necessary to practise bronchotomy. M. Louis, in an excellent memoir, on extraneous substances in the trachea, has proved, more convincingly than all other preceding writers, the necessity of the operation in circumstances of this kind. The proofs are adduced in a case, which fell under his own observation, and which we shall quote.

On Monday, the 19th of March, 1759, a little girl, seven years old, playing with some dried kidney-beans, threw one into her mouth, and thought she had swallowed it. She was immediately attacked with a difficulty of breathing, and with a convulsive cough, which was very afflicting. The little girl said, she had swallowed a bean, and such assistance as was thought proper, was given her. Want of success was the cause of several surgeons being successively sent for, who vainly employed the different means, prescribed by art, for extracting foreign bodies from the œsophagus, or forcing them into the stomach. A fine sponge, cautiously fastened to the end of a whalebone probang, was repeatedly introduced through the whole extent of the œsophagus. The little girl, who made a sign with her finger, that the foreign body was situated in the middle of the neck, thought that she felt some relief, when the sponge was conveyed below the place which she pointed out. She had, every now and then, a violent cough, the efforts attending which produced convulsions in all her limbs. Deglutition was unobstructed; and warm water and oil of sweet Almonds had been swallowed without difficulty. Two whole days had passed in sufferings, when the relations called M. Louis to render his assistance. The little girl, with all possible fortitude and sense, was several times held in her friend's arms, ready to die of suffocation. M. Louis, well aware of what had happened, came into the room, where the patient was. She was sitting up in her bed, suffering no other symptom, than a very great difficulty of breathing. M. Louis enquired where she felt pain, and she made such a sign in reply, as left no doubt concerning the nature of the accident. She put the index finger of her left hand on the trachea, between the larynx and sternum. The fruitless attempts which had been made in the œsophagus, with a view of dislodging the foreign body; the nature and the smallness of this body, which was not such as would be stopped in the passage for the food; and the facility of swallowing, were negative proofs that the bean was not in the œsophagus. Respiration was

the only function disturbed; it was attended with difficulty, and a rattling in the throat. The little girl expectorated a frothy fluid, and she pointed out so accurately the painful point where the object producing all her sufferings was situated, that M. Louis did not hesitate to declare to the relations, from this single inspection, that the bean was in the wind-pipe, and that there was only one way of saving the child's life, which was to make an incision, for the purpose of extracting the foreign body. He apprised them that the operation was neither difficult nor dangerous, that it had succeeded as often as it had been practised, and that the very pressing danger of the case only just allowed time to take the opinion of some other well-informed surgeons, respecting the indispensable necessity for such an operation. M. Louis thought this precaution necessary, in order to acquire the confidence of the parents, and to shelter himself from all reproach, in case the event of the case should not correspond with his hopes. M. Louis went home to prepare all the requisites for bronchotomy, and, in two hours, he was informed the surgeons, who were consulted, waited for him. Since M. Louis went away, the child had become quiet, and was lying on its side asleep. The opinion he had delivered, had been ill-explained by the friends and attendants, and had been discussed, before his return. They, who had been rendering her assistance, on the supposition, that the foreign body was in the œsophagus, evinced surprise at the proposal of extracting, by an operation, a substance, the presence of which, in any part of this tube was not obvious. M. Louis explained his advice, in regard to bronchotomy, and he did not expect a doubt to be set up against so positive a fact. The investigation of truth may authorize objections, to which those who make them, only give the value which is due; but M. Louis was asked concerning the possibility of the case. It was objected, that a substance as large as a bean could not insinuate itself into the trachea. He brought every one into his sentiment, by a short explanation of cases of this sort, with which he was himself acquainted. The little girl was examined, she was better, than when M. Louis saw her before, and a very palpable emphysema was seen above the clavicle, on each side of the neck, a symptom which did not exist two hours previously. This swelling made M. Louis conclude, that the urgency for the operation was still greater. The friends, whose confidence had been shaken by the opposition he had experienced in bringing about unanimity,

were in the greatest embarrassment, when they were told, that the child might die of an operation, which he had represented as only a simple incision, free from all danger. M. Louis was repeatedly asked, if he would be responsible for the child's life during the operation, and he in vain replied, that if there were any thing to fear during the operation, it would be from the accident itself, and not from the assistance rendered. This distinction was not perceived, and M. Louis withdrew, at the same time refusing his consent to the exhibition of two grains of emetic tartar, the effect of which would be useless, and might be dangerous. The medicine was given in the night: the child was fatigued with its operation, and quite unbenefited. On Tuesday morning, M. Louis found the little girl very quiet, and they who had paid their visits before him, found her wonderfully well. The respiration, however, continued to be still attended with a rattling noise, which M. Louis had observed in the evening, when the breathing was much more laborious. The child was nearly suffocated several times in the course of the day, and died in the evening, three days after the accident.

M. Bordenave, who had seen the patient, informed M. Louis of the child's death on Friday. The body was opened, before a numerous assembly of persons. After making a longitudinal incision through the skin and fat, along the trachea, between the sterno-hyoid muscles, M. Bordenave slit open the trachea, cutting three of its cartilages. This very instant, every one could see the bean, and M. Louis took it out with a small pair of forceps. It was manifest, from the ease, with which this foreign body was extracted, that the operation would have had, on the living subject, the most salutary effect. The relations had to regret having sacrificed a child, which was dear to them, to an irresolution and a timidity, which the most persuasive arguments could not remove. (*Mem. de l'Acad. Royale de Chirurgie, Tom. 12, p. 293, &c. Edit. in 12mo.*)

This case evinces, in the most decided manner, the symptoms, which result from the presence of foreign bodies in the trachea, and shews the only one surgical proceeding, which can be of use. But, among the phenomena, apparently difficult of explanation, is the calm, which, at different intervals, followed the afflicting cough. Anatomy, however, has dispelled much of the doubt on this matter. It is known, that the whole canal of the trachea is much less sensible, than the rima glottidis. A foreign body, like a bean, may remain a certain time in that canal with-

out much inconvenience, the passage being only somewhat obstructed, according to the position of the substance. It may even remain several days, months, or years, without producing any symptom of its presence, except a trivial sensation of obstruction, and this is what happens, when the body lodges in one of the ventricles of the larynx. Facts of this kind are to be found in Tulpus, Bartholine, and many other observers. But, when the extraneous substance quits its situation, and is carried into the trachea, the irritation, which it produces there, and, particularly, about the larynx, occasions coughing, and if, in the fits, the foreign body should become fixed between the lips of the glottis, it may cause instantaneous death, as probably has happened in many of the cases of suffocation from extraneous substances.

Another remarkable circumstance which deserves more attention, as it confirms the presence of a foreign body in the trachea, is the emphysema, which appeared about the clavicle, towards the termination of the case. M. Louis did not believe, that any of the persons, who saw the patient, could entertain a just idea of the origin of this symptom. It might be imagined, that the obstruction, which the foreign body caused, for two days, to the free passage of the air, might have occasioned a forcible distention of the trachea, and a rupture of the membranes, which connect together the cartilaginous rings of this tube; but this error was dispelled by the examination after death. The windy tumour had not originated in the circumference of the trachea; here its limits were only seen. The very substance of the lungs, and the mediastinum, were emphysematous. The air, which was confined by the foreign body, must have ruptured the air-cells, during the violent fits of coughing, and thus insinuated itself into the interlobular cellular substance of the lungs. Thence the air must have passed into the cellular substance of the lungs. Thence it must have passed into the cellular substance connecting the pleura pulmonalis with the outer surface of these organs, and by the communication of the cells with each other, it produced a prodigious swelling of the cellular substance, separating the two layers of the mediastinum. The emphysema, in its progress, at length made its appearance above the clavicles. The swelling of the lungs, and the circumjacent parts, in consequence of the insinuation of air into the cellular substance, is a manifest cause of suffocation. The tumefaction appears to be so natural an effect of the presence of a foreign body in the trachea,

that one can hardly believe it is not an essential symptom, though before M. Louis, no author made mention of it.

Foreign bodies in the trachea, however, do not always cause death so suddenly, which may be owing to their smallness, their smoothness, or the situation in which they are fixed. An example is related in *les Éphémérides des Curieux de la Nature*, Decad. 2. Ann. 10. As a monk was swallowing a cherry, precipitately, the stone of the fruit passed into the trachea. A violent cough, and excessive efforts, as it were, to vomit, were the first symptoms of the accident, and of these the patient thought he should have died. A sleep of some hours followed this terrible agitation, and the patient afterwards did not feel the least inconvenience during a whole year. At the end of this time, he was attacked by a cough, attended with fever. These symptoms became worse and worse, every day. At length the patient evacuated a stone as large as a nutmeg. It was externally composed of tartareous matter, to which the cherry-stone had served as a nucleus. A copious purulent expectoration followed the discharge of the foreign body, and the patient died consumptive some time afterwards. No mention is made of the body being opened; but, from the symptoms, there is every reason to believe, that an abscess must have arisen in the substance of the lungs, from the presence of the foreign body. That foreign bodies in the trachea, even when they do not induce pressing symptoms of suffocation, may ultimately kill the patient by inducing disease of the lungs, is proved by several cases on record, and, particularly by one, which occurred to Desault; a cherry-stone was lodged in one of the ventricles of the larynx; the patient would not consent to an operation, and died after two years *d'une phthisie laryngée*. (See *Œuvres Chir. de Desault*, Tom. 2, p. 258.)

Some valuable observations, confirming the necessity of an early recourse to bronchotomy, in cases, where foreign bodies are lodged in the trachea, have been published by M. Pelletan, now one of the surgeons of the Hôtel-Dieu, and a practitioner of vast experience. In one case, in which a bean had fallen into a child's trachea, and in which the most urgent symptoms of suffocation had prevailed for four days, and convulsions during the last thirty-six hours of this space of time, M. Pelletan performed the operation, which a timid practitioner, under whose management the young patient was first placed, had neglected to do at an earlier period. Upon the incision being made into the trachea, the bean was immediately thrown

out to the distance of two feet, and the child for a time was relieved. The little boy was so extremely weak, that it was at one time supposed he was dead. However, with the assistance rendered to him, he gradually revived, even regained his senses, called his parents, and asked for such things as he wanted.

This hopeful state lasted eight or ten hours, after which, convulsions came on again, and the child died fourteen hours after the operation.

Notwithstanding the turgid appearance of all the blood-vessels of the brain, as detected after death, the little boy had yet received a degree of relief at the instant of the foreign body being extracted. M. Pelletan deems it unnecessary to insist on the great probability of success, that would have attended the operation, had it been performed at an earlier period.

Of such success, M. Pelletan gives us the following example.

In the month of May, 1798, a child, about three years old, was brought to the Hôtel-Dieu, who, in playing with some French beans, and putting them into its mouth, let one of them slip into the trachea. For three days, the child was afflicted with a continual cough, and sometimes the symptoms of suffocation were most pressing. This time had been spent in administering emetics, introducing instruments into the œsophagus with the design of forcing the foreign body into the stomach, and in inspiring the relations with a pernicious confidence, arising from the very long intervals of repose, which the child experienced, during which, however, a rattling in the throat continued, a characteristic mark of the accident. Pelletan immediately decided to perform the operation. The child was very fat, and this circumstance, together with the small diameter of the trachea at this age, rendered the exposure of the anterior portion of this tube difficult. Pelletan was at this moment struck with the reflection, that bronchotomy should never be attempted except by men of science, coolness, and experience in operations. The rings of the trachea, however, were at length cut, and there was no sensible interval, between the incision and the expulsion of the foreign body. The bean had swelled considerably with the moisture. The child seemed restored to life; it spoke freely; it was only troubled with coughing, the effect of a small quantity of blood insinuating itself into the trachea, which fluid was instantly rejected again. This event has the appearance of convulsions, and may alarm those, who do not understand it; but, according to Pelletan, it is the guarantee of the patient's life by

expelling, incessantly, and without difficulty, whatever happens to get into the trachea. The wound was healed in twenty days, and the child's voice was not perceptibly altered.

In another interesting case, recorded by the same writer, a pebble was lodged in the windpipe, and the case, not being understood, was treated, for about three weeks, as a simple inflammation of the lungs. At last, bronchotomy was performed, and, by placing the child in a horizontal position, the stone was soon discharged through the incision. The patient was immediately relieved; but, the effects of the inflammation of the lungs, and injury which these organs had sustained, could never be entirely cured, and the child died phthisical eight months afterwards.

M. Pelletan details other cases, in which the foreign body, being fixed in the trachea, could not be forced out by the breath, as soon as the incision was made, but, required further means to disengage it. In one instance, Pelletan made a long cut in the windpipe of a child; but, nothing made its appearance. A probe, wrapped round with some oiled linen, was then introduced several times up and down the larynx, without creating a great deal of uneasiness, and the child continued to respire very well through the opening in the trachea. The foreign substance was presently brought to the wound and extracted: it proved to be part of the jaw of a mackarel, with many sharp teeth in it. This child soon experienced a perfect recovery.

In another instance, a young man came to the Hôtel-Dieu, in consequence of being afflicted, for six weeks, with a severe cough, frequently accompanied with a sense of suffocation. These complaints, on enquiry, were ascertained to arise from a button mould having fallen into the trachea. An opening was, therefore, made in this tube; but, though the button could be felt, it could not be extracted with the finger. The cricoid cartilage was now divided, and the foreign body was then taken out of the left ventricle of the larynx. The man recovered.

In one case, related by Pelletan, a piece of tendon of veal, got down the glottis, and gave rise to most dangerous symptoms. The foreign body was described as being so large, that this surgeon could not but suppose, that the complaints were owing to its lodgment in the œsophagus, as it seemed to be incapable of entering the glottis. The introduction of instruments down the pharynx, however, produced no relief; but, on dividing the thyroid cartilage, Pelletan passed his finger

within the larynx, and, without knowing it, pushed the piece of tendon towards the glottis, when, with the aid of a probang, it was forced into the pharynx and swallowed. The patient experienced immediate relief, and got quite well. (See *Pelletan's Clinique Chirurgicale*, Tom. 1.)

With respect to bronchotomy, or cases, in which extraneous substances are supposed to be lodged in the trachea, one important caution seems necessary, viz: whenever the foreign body is above a certain size, a probang should always be passed down the œsophagus before cutting into the windpipe; for, very similar symptoms to those, which proceed from extraneous substances in the trachea, may be caused by the lodgment of foreign bodies in the œsophagus. In fact, bronchotomy has actually been performed, while the extraneous substance was in the œsophagus, from which last situation no attempt was made to displace it, and the patient lost his life. (See *Œuvres Chirurgicales de Desault*, Tom. 2, p. 261.)

Bronchotomy has been proposed in cases, in which the tongue is so enlarged, as totally to shut up the passage through the fauces. Richter mentions an inflammation of the tongue, in which this part became four times larger than in the natural state. Valescus had made the same observation: *Ego aliquando vidita magnificatam, linguam propter humores, ad ejus substantiam venientes, et ipsam imbibentes quod quasi totum os replebat, et aliquando ex ore exibat. Lib. 2, cap. 66.* Such prodigious swellings of the tongue, are said sometimes to occur in malignant fevers, and the small-pox. They are also sometimes quite accidental, as, for instance, the cases which happen from the stings of insects, or the unskilful employment of mercury. Mr. B. Bell gives an example of the latter sort. He says, that the patient had taken, in a very short time, so large a quantity of mercury, that the part became alarmingly swollen in a few hours, and, though all the usual remedies were tried, none had the least effect. Bronchotomy was delayed till the patient was nearly suffocated; but he was restored as soon as an opening was made in the trachea. Some have objected to this practice, alleging, that scarifying the tongue will bring relief in time. (*Encyclopédie Méthodique; Partie Chirurgicale, Art. Bronchotomie.*) M. Malle's observations on the swelling of the tongue, and the most effectual means of relieving it, seem to confirm the latter sentiment.—(*Mém. de l'Acad. de Chirurgie*, Tom. 14, p. 408, &c. Edit. in 12mo.)

In cases of the preceding description, Desault would have advised the introduc-

tion of an elastic gum catheter, from the nose into the trachea, in order to enable the patient to breathe, until the swelling of the tongue had subsided. (See *Œuvres Chirurgicales de Desault par Bichat, Tom. 2, p. 246.*)

Bronchotomy has been proposed, when both the tonsils are so enlarged that they quite impede respiration. Here, the inflammatory swelling is not meant; this commonly soon suppurates, and the spontaneous bursting of the tumour, or the opening of it with a pharyngotomus, always does away the necessity for so extreme a measure. It is the chronic enlargement now alluded to, that case mentioned in the article *Tonsils*, and which sometimes acquires an immense size. From our remarks on the disease, it will be seen, that more is to be expected from the excision of the tonsils, than from the operation now in question. Besides, before the glands are so large as to threaten suffocation, they should be cut away, in preference to performing bronchotomy, which would relieve the urgency, but not the cause. In general, there is here only a fear of suffocation, when the swelling is such as not only to shut up the posterior aperture of the mouth, but also the posterior openings of the nostrils, which is exceedingly rare. In cases of obstructed respiration from enlargement of the tonsils, Desault preferred the introduction of the elastic catheter, from the nose into the larynx, to the operation of bronchotomy. It is not common for a polypus to make this operation necessary. Boerhaave, however, mentions a case, in which the patient was suffocated, as the surgeon was going to extirpate a tumour of this kind: no doubt, this patient might have been saved, if bronchotomy had been previously performed. Polypi, growing in the larynx itself, are very rare; but, examples are recorded; and, if such tumours happen to obstruct the glottis, the patients are instantly suffocated. Some instances of this kind are related by Bichat. The only mode of getting at such swellings so as to extirpate them, is by performing bronchotomy. (See *Œuvres Chirurg. de Desault par Bichat, Tom. 2, p. 254, 255.*)

Lastly, bronchotomy has been recommended to be done on persons recently suffocated or drowned. Detharding is the first author, who has treated of the necessity of this operation, in the latter case, in a letter addressed to Schroeck, intitled, *De Methodo subveniendi submersis per laryngotomiam. Hactenus rectè, says Haller, si spuma quæ pulmo in submersis offereatur eâ administratione repelli quiveret.* This writer maintains, that drowned persons have no water in their chests, or

air-vessels of the lungs, and that they perish suffocated, for want of air and respiration, and that, while the person is under water, the epiglottis applies itself so closely over the glottis, that not one drop of water can pass. But, these assertions are quite contrary to the numerous experiments made by M. Louis, who drowned animals in coloured fluids, and proved that they who are drowned, inspire water, with which the air-vessels and cells are quite filled. M. Louis has also opened men, who have perished under water, but, in them, he never found the epiglottis applied to the glottis, as Detharding says it is; indeed, anatomy proves the impossibility of its being so. Detharding's theories were wrong, and, as he did not use any power to distend the lungs with air, his mere practice of bronchotomy must have been useless. When there is a free communication between the cells of the lungs and the atmosphere, the air will not expand these organs, if the inspiratory muscles can no longer act. Hence, after opening the trachea, and letting as much water run out of this tube as possible, the pipe of a pair of bellows should be introduced, and the air forcibly introduced into the lungs.

Detharding's opinion, that drowning is a species of suffocation, was right, and that the privation of oxygen gas is the cause of death. Hence, we see the propriety of introducing this air into the lungs, as speedily as possible, whenever we think, that animation has not been so long suspended, that every hope of restoration is over. Indeed, it is proper to distend the lungs with air, in all cases in which animation has been recently suspended by suffocation, immersion under water, or by noxious vapours and gases. This measure is highly proper, in conjunction with electricity, the communication of warmth to the body, the application of strong volatiles to the nostrils, rubbing the body with warm flannels, and the injection of any fluid, like warm wine and water, into the stomach, through a hollow bougie. Tobacco clysters, which even have had the sanction of the Royal Humane Society, should, however, be reprobated, as the qualities of this plant are peculiarly destructive of the vital principle, and not simply stimulating. I am sorry to find this last means commended by so respectable a surgeon as M. Larrey, who joins the rest of the French surgeons in condemning electricity and bronchotomy. He speaks in favour of opening the jugular vein, exposing the body to the fire, friction, &c. On dissecting the bodies of some drowned persons, M. Larrey found, as M. Louis had

done long since, that the air-tubes of the lungs were filled with water, instead of air, and, that the epiglottis was raised and applied to the os hyoides. (See *Mémoires de Chirurgie Militaire*, Tom. 1, p. 83—85.)

There are many modern practitioners, who consider bronchotomy, as needless in cases of suspended animation, because, it is contended, that, as the patient is always destitute of sensation, a tube may easily be passed into the trachea from the nose or mouth, for the purpose of inflating the lungs. Either the curved pipe of a pair of bellows may be introduced into the glottis through the mouth, or an elastic gum catheter may be passed into the trachea from the nose. "*On peut mettre ce moyen à exécution (says Pelletan) chez les asphixiés, ou les enfans nouveaux nés, qui ne respirent pas; parce, dans ces différens cas, non seulement il n'y a pas d'inflammation, mais même toute sensibilité est suspendue, et la canule est commode pour souffler de l'air dans les poumons, en même temps qu'elle peut causer une irritation salutaire. M. Baudelocque, mon célèbre confrère m'a témoigné se servir habituellement, et avec succès de ce moyen pour appeler à la vie les nouveaux nés dont la respiration ne s'établit pas.* (*Clinique Chirurgicale*, Tom. 1, p. 29.)

Desault likewise conceived, that the lungs might be easily inflated, without performing bronchotomy. (*Œuvres Chir.* Tom. 2, p. 239.)

Mr. A. Burns adopts the same sentiment. (*Surgical Anatomy of the Head and Neck*, p. 384.)

My own individual opinion upon this subject is, that, if a surgeon knows, that he can inflate the lungs as completely and expeditiously, without performing bronchotomy, as he could, by making an incision in the trachea, he is right in dispensing with the latter operation. But, in the generality of cases of suspended animation, (that of new-born infants excepted) where bronchotomy would be an objectionable undertaking, I much doubt, whether in actual practice bronchotomy will not be found the best and most speedy means of enabling the surgeon to distend the lungs with air. If you follow Desault's suggestion, I contend, that you are likely to be some minutes longer in getting the elastic catheter from the right nostril into the larynx, than you would be in cutting into the trachea, and introducing into the incision the muzzle of a pair of bellows. Supposing the elastic catheter introduced, will you now be able to distend the lungs with air, in an adequate degree, an object of the highest moment? A pair of bellows seems to me

almost essential to this purpose. I shall say nothing on the probability of many practitioners coming to the patient unprovided with the requisite sort of tube.

If a pair of bellows, with a curved pipe, be employed, many surgeons would be a considerable time in getting the muzzle into the glottis, and, in the mean while every spark of life might be extinguished. On the other hand, bronchotomy (performed by a man of ordinary care and skill) is an operation free from danger. It may be executed with a pen-knife, if no better instrument be at hand; and, when the incision has been made, a pair of common bellows will suffice for the inflation of the lungs. Did I conceive, that bronchotomy were a perilous operation; that the lungs could be effectually distended without the employment of bellows; that the object could generally be accomplished as expeditiously without cutting into the trachea; I should be as ready to join in the condemnation of this last proceeding as any cotemporary writer. Greatly, however, as I respect most of the authors, who differ from me on this point, the reasons I have assigned, prevents me from subscribing to their sentiment. Desault, who may be regarded as the founder of the doctrine, concerning the inutility of bronchotomy, it is also to be observed, spoke only from theory, and not actual practice, in these cases.

DESCRIPTION OF THE OPERATION.

No preparation is necessary, as delay only increases the danger. The patient being seated in an arm-chair, or, what is better, laid on a bed with his head hanging backward, an incision is to be made, which is to begin below the cricoid cartilage, and to be continued downward, about two inches, along the space between the sterno-thyroidæ muscles. Care should be taken not to cut the lobes of the thyroid gland, lest a troublesome and dangerous bleeding should be occasioned, and, as the left subclavian vein lies a little below the upper part of the first bone of the sternum, the incision should on no account ever extend in the least below the top of this bone. The knife must not be carried either to the right or left, in order to avoid all risk of injuring the large blood vessels situated at the sides of the trachea. The incision in the integuments being made, the sterno-thyroidæ muscles are to be pushed a little towards the side of the neck, so as to bring the trachea fairly into view. Most authors recommend the point of the knife to be then introduced between the third and

fourth cartilage of the trachea, and the opening to be enlarged transversely. It is true, that, in this way, an opening may be safely made, large enough to allow of the introduction of a small cannula. It is safer, however, in all cases, to enlarge the opening in the perpendicular direction, by cutting from within outward. There is no advantage in avoiding a wound of the cartilages of the trachea, and this was the only reason for cutting the membrane between two of them, in a transverse direction; while a sufficiently large opening could not thus be safely obtained in cases in which it is necessary to introduce the muzzle of a pair of bellows, in order to inflate the lungs. In short, it is safer and better, in every instance, to make the wound in the trachea in a perpendicular manner.

I have stated, that bronchotomy may be performed by a man of ordinary skill, without hazard. It is far otherwise with a careless practitioner. We read in Desault's work, that, in one instance, the carotid artery was wounded. The following cautions, given by Mr. A. Burns, seem entitled to notice. "The arteria innominata is in risk in some subjects. I have seen it mounting so high on the forepart of the trachea, as to reach the lower border of the thyroid gland. Even the right carotid artery is not always safe. I am in possession of a cast, taken from a boy of twelve years of age, which shews the right carotid artery crossing the trachea in an oblique direction. In this subject, that vessel did not reach the lateral part of the trachea till it had ascended two inches and a quarter above the top of the sternum.

"Where both carotid arteries originate from the arteria innominata, there is considerable danger in performing the operation of tracheotomy, for, in such cases, the left carotid crosses the trachea pretty high in the neck. Professor Scarpa has seen a specimen of this distribution in a male subject, and I have met with five.

"These varieties in the course of the arteries are worthy of being known, and remembered; they will teach the operator to be on his guard, since he can never, *a priori*, ascertain the arrangement of the vessels with any degree of certainty. It will impress on his mind the impropriety of using the knife further, than merely to divide the integuments and fasciæ. If he then clear the trachea with the fingers, he will never injure any of the large arteries. When, with the finger, he has fairly brought the trachea into view, he ought to examine carefully, whether any of the large arteries lie in front of it, and if he find one, he ought to depress it to-

ward the chest, before he penetrates into the windpipe.

"In cutting into the trachea, the preferable plan is to cut the rings from below upward, avoiding injury of the thyroid gland." (See *A. Burns on the Surgical Anatomy of the Head and Neck*, p. 393—394.)

When bronchotomy is performed for the purpose of inflating the lungs, the cut in the windpipe must be made somewhat larger than when only an opening is required to enable the patient to breathe through a small cannula. The larger size of the pipe of the bellows, is the reason of this circumstance.

When a cannula is to be introduced, care must be taken not to pass it too far into the wound, lest it should injure the opposite side of the trachea. This is a caution, on which Fabricius ab Aquapendente dwells very strongly, and with good reason.

Small as the vessels may be, which are divided in bronchotomy, they occasionally bleed so much, as to create apprehension, and even prevent the process of the operation. There is a case in Van Swieten's Commentaries, confirming this remark. A Spanish soldier, aged twenty-three, was in the most urgent danger from an inflammation of his throat. It was thought nothing could save him, except bronchotomy. After the longitudinal cut in the skin, and the separation of the muscles, the trachea was opened between two of the cartilages; but the blood insinuated itself into this canal, and excited so violent a cough, that the cannula could not be kept in by any means, though it was replaced several times. M. Louis remarks, that, in this instance, the patient's head should have been turned downward, in order to keep the blood from flowing backward into the trachea. It is asserted, that the opening of this tube was not always opposite the external wound, in consequence of the convulsive action of the muscles, and that the patient on this account could hardly breathe. Hence M. Vigili was induced to slit open the trachea, down to the sixth cartilaginous ring; and it was only then that he inclined the patient's head forward. The bleeding now ceased, the patient breathed with ease, and, on the second day, the inflammation was so much better, that respiration could go on without the aid of the opening in the trachea.

To obviate the preceding accident, a proposal has been made to adapt a cutting blade to a cannula, of a suitable size, adapted for remaining in the wound, and sufficiently compressing the orifices of such vessels as might be opened. In

Richter's *Observationes Chirurgicæ*, a description of some instruments of this kind may be seen. Mr. B. Bell has described one, somewhat like a flattened trocar, only not quite so long. The patient's head being inclined backward, as far as possible, the point of the instrument is to be introduced between two of the cartilages: between the lower margin of the thyroid, and the upper edge of the cricoid, is said to be the best situation, being more extensive, less vascular, and, after the division of the skin, there being only the crico-thyroid ligament to be divided. When the instrument has entered, the lancet is to be withdrawn, and the cannula fixed, by means of a ribbon, which is tied to each of the wings of the instrument, and must be fastened at the back of the patient's neck. Should the instrument be too long, it should be passed through two or three little compresses, before being put into the windpipe, which artifice will make it answer as well as a shorter one. A piece of gauze is then to be tied once on the outward orifice of the cannula.

Sometimes, though very seldom, the cannula becomes obstructed with mucus, or clots of blood. Such an accident nearly suffocated a patient at Edinburgh. A man of genius, who was at hand, suggested the introduction of a second cannula into the first; the second one being taken out, and cleaned, as often as necessary, and then replaced. Monro, the father, used to recommend this plan. It is better, however, to have once a double cannula, to fit the stilette.

The use of the cannula must be continued as long as the causes, obstructing respiration, remain.

When respiration is suspended by the presence of a foreign body in the trachea, and the extraneous substance does not make its appearance at the opening made, a trial may be made to discover its situation by means of a bent probe. When it lies downward, which it hardly ever does, the wound in the trachea may be enlarged in this direction, and the body may be extracted with a pair of curved forceps. The extraneous substance is mostly forced out by the air, as soon as the incision in the trachea is opened. When it cannot be immediately found, some practitioners (Heister and Raw) have succeeded by keeping the lips of the wound asunder with pieces of sheet-lead, by which means, the force of the air in expiration has, in a few hours, expelled the foreign body,

Richter thinks he has perfected bronchotomy, by using a curved cannula; but, the inconveniences, which he attaches to

the straight one, hardly ever occur. A curved cannula cannot be so conveniently introduced into another one similarly shaped.

On the continent, the operation of laryngotomy, which was first advised, by Vicq. d'Azyr, and is recommended by Desault, is mostly preferred to tracheotomy. The surgeon makes an incision over the anterior part of the thyroid cartilage, punctures the crico-thyroid membrane, and, if it be necessary, introduces a director, and slits the thyroid cartilage upwards. A mere opening in the crico-thyroid membrane would suffice for the introduction of a cannula for the purpose of enabling the patient to breathe; in most other instances, it would be necessary also to cut the thyroid cartilage. The fact, that extraneous substances, when they are loose, are almost always lodged at the upper part of the larynx, indicates, that bronchotomy in such cases must generally be most advantageous; and, according to Desault, even when the foreign bodies are lower down in the trachea, they may ordinarily be most easily extracted with the aid of a pair of curved forceps. In this country, laryngotomy has had few advocates, though it was, a few years since, commended by Mr. Coleman.

The reader may collect the most valuable information on the foregoing subject from the following sources: *Hévin sur les corps Etrangers qui sont arrêtés dans les premières Voies, et qu'il faut tirer par incision, in Mém. de l'Acad. Royale de Chirurgie, Tom. 3, p. 131, &c. edit. 12mo.* Louis, *Mémoire sur une question Anatomique relative à la jurisprudence, où l'on établit les principes pour distinguer, à l'inspection d'un corps trouvé perdu, les signes du suicide d'avec ceux de l'assassinat.* Van Swieten's *Commentaries.* Habicot, *Question Chirurgicale, par laquelle il est démontré que le Chirurgien doit assurément pratiquer l'opération de la Bronchotomie, &c. published, 1620.* *Mémoire sur la Bronchotomie par M. Louis, in Mém. de l'Acad. de Chirurgie, Tom. 12, Edit. 12mo.* *Second Memoir on this subject, inserted by the same writer in the said volume.* *De la rescission des Amygdales, Tom. 14, p. 283, &c.* *Précis d'Observations sur le Gonflement de la Langue, &c. par M. de la Malle, Tom. 14, p. 408.* *Lescure, sur un portion d'Amande de noyau d'Abricot, dans la Trachée Artère, Tom. 14, p. 427.* *Suite d'Observations sur les Corps Etrangers dans la Trachée Artère, Tom. 14, p. 432.* *Expériences sur ces las par M. Favier, Tom. 14, p. 445.* *Bertrandi, Traité des Opérations de Chirurgie, p. 402, &c Edit 1784.* *Sabatier, de la Médecine Opératoire, Tom. 2, p. 283, Edit. 1.* *Œuvres Chirurgicales de De-*

sault par Bichat, Tom. 2, p. 236, &c. *Pelletan, Clinique Chirurgicale, Tom. 1, First Memoir. Cheyne, Pathology of the Larynx and Bronchia. A. Burns, Surgical Anatomy of the Head and Neck, p. 377, to 401. Richter's Anfangsgrunde der Wundarzneikunst, Band 4, p. 225, &c. Gottingen, 1800.*

BUBO. (*βουβων*, the groin.) Modern surgeons mean, by this term, a swelling of the lymphatic glands, particularly of those in the groin, and axilla.

The disease may arise from the mere irritation of some local disorder; from the absorption of some irritating matter, such as the venereal poison; or from constitutional causes.

Of the first kind of bubo, that, which is named the *sympathetic*, is an instance. Of the second, the venereal bubo is a remarkable specimen. (See *Venereal Disease*.)

The *pestilential bubo*, which is a symptom of the plague, and the *scrofulous* swellings of the inguinal and axillary glands; may be regarded, as examples of buboes from constitutional causes. (See *Scrofula*.)

SYMPATHETIC BUBOES.

The inguinal glands often become affected with simple phlegmonous inflammation, in consequence of irritation in parts, from which the absorbent vessels, passing to such glands, proceed. These swellings ought to be carefully discriminated from others, which arise from the absorption of venereal matter. The first cases are simple inflammations, and only demand the application of leeches, the cold saturnine lotion, and the exhibition of a few saline purges; but the latter diseases render the administration of mercury indispensable.

Sympathetic is the epithet usually given to inflammation of glands from mere irritation; and, we shall adopt it, without entering into the question of its propriety.

The sympathetic bubo is mostly occasioned by the irritation of a virulent gonorrhœa. The pain, which such a swelling gives, is very trifling, compared with that of a true venereal bubo, arising from the absorption of matter, and it seldom suppurates. However, it has been contended, that the glands in the groin do sometimes swell and inflame from the actual absorption of venereal matter from the urethra, in cases of gonorrhœa, and which swellings must consequently be venereal. (*Hunter on the Venereal, p. 57.*)

The manner, in which buboes form from mere irritation, will be better understood by referring to the occasional ill consequences of venesection, in the article

Bleeding. The distinguishing characters of the venereal bubo are noticed in the article *Venereal Disease*.

PESTILENTIAL BUBO.

A pestilential bubo, at its commencement, is a small, hard, round tumour, readily perceptible to the touch, about the size and shape of a pea; it is moveable under the skin, the appearance of which is not altered at an early period, the bubo lying more or less deeply, and the swelling not appearing externally. As the tumefied gland enlarges, it changes from a round to an oval shape, becoming, at the same time, less moveable. The integuments now begin to thicken, and the swelling to appear externally. The appearance of the bubo is often preceded by a sense of tightness and pain, sometimes of a lancinating kind, or by an itching in the part, where it is about to appear, and, now and then, the disease is preceded by shivering. In many cases, however, the small swelling, just described, comes on, without being preceded by any peculiar symptoms.

Some buboes are indolent, and insensible, others very sensible and rapid in their progress. When the tumour advances quickly to suppuration, the circumstance is generally regarded as favourable. Cases, however, in which the matter soon forms, are frequently fatal, and there are many histories of other cases, which terminated favourably, though the buboes were extremely indolent, and ended in resolution.

It is difficult to foresee in what way a bubo will terminate. The fluctuation is often scarcely perceptible, where suppuration has taken place, and buboes are sometimes resolved, after there has been a very evident fluctuation. Their progress, indeed, is almost always, more or less, irregular, especially, after the first week. At one time, they seem advancing to suppuration; at another time, they shew a tendency to resolution. But, these variations, Dr. Russell remarks, chiefly respected the integuments; for, the gland itself, when carefully explored, was seldom found to alter; and, when the tumour actually dispersed, it was not suddenly, but, by slow degrees. Thus, from the alteration in the integuments alone, the whole tumour, on a superficial view, seemed to lessen or increase, though the gland remained the same; and Dr. Russell was inclined to think, that this deception was often the cause of the bubo being said to fluctuate, or to vanish in appearance, and again return. However, he is far from thinking,

that this fluctuation was never real. Cælius observes: *Vidimus quoque abruptam suppurationem in his resuscitari, ac demum per effusionem puris absolvi.*

The bubo, as it increases in size, becomes somewhat flat; and, generally about the second week, the skin over it grows tense, and painful, and begins to be inflamed. In some cases, the inflammation is moderate; in others, considerable; but, it seldom terminates in gangrene, although the skin, now and then, assumes a bluish colour.

Sometimes, however, the bubo suppurates without the skin seeming to be at all inflamed; and, in this circumstance, as the tumour is generally harder, than a suppurated venereal bubo, it is often difficult to determine, whether suppuration has taken place, or not. When buboes break spontaneously, it generally happens in the third week; sometimes at a later period.

The buboes most frequently appear in the groin, or a little lower, among the lowest cluster of inguinal glands. They also frequently appear among the axillary glands: sometimes, though more rarely, they have their seat in the parotid, and the disease is then by many reckoned more dangerous, than when the buboes appear in the groins, or armpits. Still more rarely, they appear in the maxillary, or cervical glands. These latter, Dr. Russell remarks, were seldom observed to swell, without either the parotid swelling at the same time, or soon afterwards, or a carbuncle protruding near them. They never were the sole pestilential eruptions; and he recollects few instances of their coming to maturation. It has been remarked by others, that the parotid bubo seldom appears unaccompanied by one, or more, in the axilla, or groin.

Axillary buboes, generally speaking, suppurate more frequently than those about the fauces, and the inguinal more frequently than the axillary.

Buboes often make their appearance on the first day of the complaint; sometimes, indeed, they are among the first symptoms. It has been observed, that when they appear later, than the third, or fourth day, they are generally preceded by an exacerbation of the febrile symptom. Those, which come out at so late a period, however, are not, for the most part, the first, which appear in the course of the complaint; for, a succession of buboes sometimes takes place, till three or four have made their appearance.

Sometimes, no buboes appear, and these cases are, upon the whole, the most fatal. Thus is a circumstance, which par-

ticularly demands attention, as the cases, unattended with buboes, and other pestilential eruptions, generally make their appearance at the commencement of the epidemic, and have often, in consequence of the absence of the eruptions, been mistaken for other complaints. In other cases, particularly, towards the decline of the epidemic, the buboes, and other eruptions, often form the principal part of the complaint, which is then unattended with danger; from which it would appear, that the eruptions in the plague are to be regarded as favourable symptoms.

- When the inflamed gland advances to suppuration more rapidly than the integuments; troublesome fistulous ulcers are sometimes formed, if an artificial opening has not been made in the skin. This accident, however, is rare: in general, the buboes, when left to themselves, do not prove troublesome.

When they do not suppurate, and the patient recovers, they gradually disperse generally in the space of a few weeks. In some cases, they are succeeded by an induration of the gland, which remains for many months. Even when suppuration has taken place, if the cure proves tedious, either in consequence of the matter having been discharged by too small an opening, or the opening having repeatedly closed in the progress of the cure, a similar induration sometimes succeeds; which, in like manner, sooner or later disappears.

In the plague, buboes, termed spurious, sometimes form. Spurious buboes differ from the true ones, in appearing indiscriminately on every part of the body; while the latter are confined to the groin, axilla, and parts about the fauces. Spurious ones were observed, says Dr. Russell, on the head, the forehead, the throat, the shoulder, above the clavicle, the neck, on, or above, the scapulæ, the back, the side, under the breast, on the belly, the hip, hind-part of the thigh, near the ham, the leg, the scrotum, the arm near the usual place of issues, inside of the arm near the elbow, outside of the forearm, and near the wrist.

Some of these buboes, if not lanced at a proper time, grow to a great size, particularly, those on the scapulæ, or back. In other parts, however, they seldom much exceed the size of a hen's egg. They generally appear about the second, or third day, after true buboes, or carbuncles; and usually suppurate, though not so quickly, as true pestilential buboes do. (See *Wilson on Febrile Diseases*.)

BUBONOCELE. (from *βῆλον*, the groin; and *κύημα*, a tumour) A species of

hernia, in which the bowels protrude at the abdominal ring. The case is often called an *inguinal hernia*, because the tumour takes place in the groin. Every thing, necessary to be known on this subject, will be found in the article *Hernia*.

BUPHTHALMUS. A morbid enlargement of the eye.

BURNS. A burn is an injury, more or less superficial, occasioned by the contact of some substance, heated beyond what the body can bear, without its fibres and organization being hurt.

Burns present different appearances, according to the degree of violence, with which the causes producing them have operated, and according to the kind of cause, of which they are the effect. Burns, which only irritate the surface of the skin, are essentially different from those, which destroy it; and these latter have a very different aspect from what others present, which have attacked parts more deeply situated, such as the muscles, tendons, ligaments, &c. Scalds, which are the effect of heated fluids, do not exactly resemble burns, occasioned by the direct contact of very hot metallic bodies, or some combustible substance on fire. As fluids are not capable of acquiring so high a temperature, as many solid things, scalds are generally less violent than burns, in the injury which they produce; but, in consequence of liquids often flowing about with great rapidity, and being suddenly thrown in large quantities over the patient, scalds are frequently dangerous on account of their extent. It is well worthy of remark, that the danger of the effects of fire is more proportioned to the size than the degree, of the injury. A burn, that is so violent, as to kill parts at once, may not be in the least dangerous, if not extensive; while, a scald, which perhaps only raises the cuticle, may prove fatal, if very large. The degree of danger, however, is to be rated from a consideration both of the size and violence of the injury. The worst burns, which occur in practice, arise from explosions of gunpowder, or inflammable gases, from ladies' dresses catching fire, and from the boiling over of hot fluids, in laboratories, manufactories, &c.

Burns, which only destroy the cuticle, and irritate the skin, are very similar to the effects, produced by cantharides and rubefacients. The irritation, which such injuries excite, increases the action of the arteries of the part affected, and they effuse a fluid under the cuticle, which becomes elevated and detached. Hence, the skin becomes covered with vesicles, or bladders, which are more or less numerous, and large, according to the man-

ner, in which the cause has operated. But, when the skin, or subjacent parts, are destroyed, no vesicles make their appearance. In this circumstance, a black eschar is seen; and when the dead parts are detached, there remains a sore, more, or less deep, according to the depth, to which the destructive effects of the fire have extended.

The parts may either be killed, at the moment of the injury, by the immediate effect of the fire, or they may first inflame, and then mortify.

In all cases of burns, the quantity of injury depends on the degree of heat in the burning substance; on the duration, and extent of its application; and on the sensibility of the burnt part.

When a large surface is burnt, mortification sometimes makes its appearance with great violence, and very quickly after the accident; but, in general, the symptom, the most to be dreaded, in such cases, is inflammation. The pain and irritation often run to such a pitch, that, notwithstanding every means, there is frequently immense trouble in keeping down the inflammation. When the burnt surface is very large, the effects of the inflammation are not confined to the part, which was first injured; but, even cause a great deal of fever; and, in certain cases, a comatose state, which may end in death.

It has been observed, that persons, who die of severe burns, seem to experience a remarkable difficulty of breathing, and oppression of the lungs. These organs, and the skin, are certainly both concerned in separating a large quantity of water from the circulation, and their participating in this function, may perhaps, afford a reason, for the lungs seeming to be affected, when a large surface of skin is injured in cases of burns. However, the kidneys perform the same office, and they are not particularly affected in burnt patients; so that the asthmatic symptoms, in these cases, are probably owing to a sympathy between the lungs and skin, or rather to causes not at present understood.

TREATMENT OF BURNS.

The former plan of treating burns was founded on principles, which seem applicable to cases of inflammation in general. The treatment was most commonly antiphlogistic, and even copious bleeding from the arm was not unfrequently practised.

We shall first offer a concise account of the old practice, as explained by Mr. B. Bell. When the skin is not destroyed, but seems to suffer merely from irritation,

relief may be obtained by dipping the part affected in very cold water, and keeping it for some time immersed. This author states, that plunging the injured part suddenly into boiling water, would also procure ease; an assertion, however, much to be doubted, and a practice not likely to be imitated. In some cases, emollients afford immediate relief; but, in general, astringent applications are best. Strong brandy, or alcohol, is particularly praised. At first the pain is increased by this remedy; but an agreeable soothing sensation soon follows. The parts should be immersed in the spirit, and, when this cannot be done, soft old linen, soaked in the application, should be kept constantly on the burn. Goulard's lotion, or a strong solution of the *acruza acetata*, is recommended, and said to prove useful, however, only by being astringent, as equal benefit may be derived from a strong solution of alum, &c. Such applications were frequently made with a view of preventing the formation of vesicles; but, Mr. B. Bell always remarked, there was less pain, when the blisters had already appeared, than when prevented from rising, by remedies applied immediately after the occurrence of the injury.

The applications should be continued, as long as the pain continues; and in extensive burns, creating great irritation, opium should be prescribed. The stupor, with which patients, so situated, are often attacked, receives more relief from opium, than any thing else.

Some recommend opening the vesications immediately; others assert, that they should not be meddled with. Mr. B. Bell thinks, they should not be opened till the pain arising from the burn, is entirely gone. At this period, he says, they should always be punctured; for, when the serum is allowed to rest long upon the skin beneath, it has a bad effect, and even induces some degree of ulceration. Small punctures, not large incisions, should be made. All the fluid having been discharged, a liniment of wax and oil, with a small proportion of *saccharum saturni*, is to be applied.

When there is much irritation and fever, blood-letting, and such remedies, as the particular symptoms demand, must be advised. When the skin ulcerates, the treatment does not differ from what will be described, when we speak of *Ulcers*.

When the burnt part, is, from the first, more or less destroyed, cooling emollient applications were formerly thought most effectual, and a liniment, composed of equal proportions of lime-water and linsced oil, gained the greatest celebrity. Even, at this day, the application is very

often employed. Mr. B. Bell advises it to be put on the parts, by means of a soft pencil, as the application and removal of the softest covering, are often productive of much pain.

In some cases, Mr. B. Bell says, Goulard's cerate, and a weak solution of the *saccharum saturni*, procure ease more quickly, than the above liniment.

The sloughs having come away, the sores are to be dressed according to common principles. (See *Ulcers*.)

When burns are produced by gunpowder, some of the grains are apt to be forced into the skin. These should be picked out with the point of a needle, and an emollient poultice applied, which will dissolve, and bring away any particles of gunpowder, which may yet remain.

Burnt parts, which are contiguous, are apt to grow together in the progress of the cure. The fingers, toes, sides of the nostrils, and the eye-lids are very liable to this occurrence. It is to be prevented by keeping dressings always between the parts, likely to become adherent, until they are perfectly healed.

The sores, resulting from burns, are, perhaps, more disposed, than any other ulcers, to form large granulations, which rise considerably above the level of the surrounding skin. No poultices should now be used. The sores should be dressed with any moderately stimulating, astringent ointment; the *basilicum* with the *pulv. hydrarg. nitrat. rub.* is now generally preferred: and if the part will allow of the application of a roller, the pressure of this will be of immense service in keeping down the granulations, and rendering them more healthy. When these methods fail, the sores should be gently rubbed with the *argentum nitratum*.

MR. CLEGHORN'S PLAN.

Mr. Cleghorn recommends the immediate application of vinegar, which is to be continued for some hours, by any the most convenient means, until the pain abates. Should it return, the vinegar is to be repeated. If the pain is so severe as to have destroyed any part, when the pain has ceased, it is to be covered with a poultice, which must remain on six, or, at most, eight hours. When this is removed, the part is to be entirely covered with very finely powdered chalk, so as to make every appearance of moisture on the surface of the sore, no longer visible. This being done, the whole is to be covered with the poultice again. The same mode is then to be pursued every night and morning, until the cure is complete. If

the use of poultices should seem to relax the ulcers too much, a plaster, or ointment, containing white lead is to be applied; but, the chalk is still to be used next the sore.

In respect to general remedies, Mr. Cleghorn allowed his patients to eat boiled, or roasted fowl, or, in short, any plain-dressed meat, they liked. He did not object to their taking moderate quantities of wine, spirits and water, ale, or porter. His applications he observed, allayed pain and inflammation, and either prevented, or removed fever, and, judging from their effects, he thought they had powerful antiseptic virtues. He never had occasion to order bark, or any internal medicines whatever, and he only once thought it necessary to let blood. When a patient was costive, Mr. Cleghorn used to order boiled pot-barley and prunes, or some other laxative nourishing food, and sometimes an injection, *but never any purgatives*. It is distressing to a patient with bad sores, to be often going to stool. Besides, Mr. Cleghorn remarked, that weakness and languor, (which never, in his opinion, hasten the cure of any sore) are always brought on, more or less, by purgatives. From the effects too, which he felt them have upon himself, and observed them to have upon others, they did not seem to him to have so much tendency to remove heat and feverish symptoms as is generally supposed, and more frequently carry off *useful humours*, than *harmful ones*.

Diluted sulphuric acid would not answer well, instead of vinegar. The latter produced most benefit, when it was fresh and lively to the taste.

In cold weather, in particular, Mr. Cleghorn used to warm the vinegar a little, place the patients near the fire, give them something warm internally, and, keep them, in every respect, in a comfortable situation. His object, in so doing, was to prevent the occurrence of tremblings, and chiliness, which, in two instances, alarmed him a good deal, after employing vinegar, which was too cold.

The account of Mr. Cleghorn's plan was published by Mr. Hunter, in the *Med. Facts and Observations*, Vol. 2.

SIR JAMES EARLE'S PLAN.

This gentleman exclusively advises the use of cold water, or rather ice; and he has brought forward several cases of extensive burns, in which this method was employed with the best effect. We have mentioned cold water, among the applications to burns, enumerated by Mr. B. Bell, and it was certainly not uncommonly used long before Sir James Earle pub-

lished on the subject. This author, however, has made the plan more extensively known, and, as it is an eligible one, he has a certain claim to praise. The burnt parts may either be plunged in cold water, or they may be covered with linen dipped in the same, and renewed as often as it acquires warmth from the part. The application should be continued as long as the heat and pain remain, which they will often do, for a great many hours. (See *Essay on the Means of lessening the Effects of Fire on the Human Body*, 1799.)

M. LARREY'S PLAN.

It seems to me, that, on the subject of burns, there is, even at the present day, as much contrariety of sentiment, as in any part of surgery whatsoever. After all the praises, which we have of late years heard of vinegar, cold applications, oil of turpentine, &c. a French surgeon, whose talents, and opportunities of observation, entitle his opinion to the highest attention, has recently censured the employment of all such remedies. M. Larrey, though a military surgeon, has had occasion to see numerous burns, in consequence of explosions. He declares, that he has been long struck with the bad effects of repellents, such as fresh water with the muriate of ammonia, oxycerate, the aqua vegeto-mineralis, and the solution of opium in ice-water, applications, which are extolled in some modern books, and used in cases of deep burns, by a great number of practitioners; and he expresses his belief, that such injuries frequently prove mortal, for want of more judicious treatment. He recommends dressing all deep burns, with fine old linen, spread with saffron ointment, which, he says, has the quality of diminishing the pain, and preventing irritation by keeping the nervous papillæ from coming into contact with the air, or being pressed by the linen and clothes. The employment of this ointment, (or, in case good oil cannot be procured for its composition, honey, instead of it) is to be continued till suppuration takes place. When this is established, M. Larrey applies the ointment of styrax, for the purpose of supporting the systaltic power of the subjacent vessels, promoting the detachment of the eschars, and checking the extension of the sloughing. As soon as the dead parts have separated, Mr. Larrey again has recourse to the saffron ointment, for which he gradually substitutes dry lint, with strips of linen spread with cerate. When the vessels exceed the level of the edge of the sore, he touches them with the argentum nitratum, and he occasionally

applies a weak solution of the muriate of mercury, or of the sulphate of copper.

M. Larrey prescribes emollient and antispasmodic beverages, which are to be taken warm, such as milk of almonds, containing nitre, and properly sweetened; hydromel; rice ptisan, &c. His patients were never deprived of light nourishment, such as broths, jellies, eggs, soups, &c. His experience had taught him, that soldiers (who it is to be observed were his patients) cannot bear low diet, so well as persons leading an inactive life. Besides, he remarks, that, as these injuries, with loss of substance, are a long time in healing, it would be acting contrarily to the precept of Hippocrates to put burnt patients on low diet. M. Larrey assures us, that he has found this simple treatment, which he calls soothing and gently tonic, almost always successful. (*See Mémoires de Chirurgie Militaire, Tom. 1, p. 93.*)

MR. KENTISH'S PLAN.

From what has been stated, it appears, that cold and hot, irritating and soothing, astringent and emollient applications, have all been outwardly employed, in cases of burns, without much discrimination.

But, the internal treatment has always been of one kind, and both the ancients and moderns agree in advising blood-letting, cooling purges, and, in short, the whole of the antiphlogistic plan. Mr. Kentish is the only one, who has ventured to put in practice stimulating means, internally, as well as externally. It is to be remarked, at the same time, that Mr. Cleghorn's practice was somewhat analogous to that recommended by the latter gentleman. He condemned purges, and he allowed his patients to take stimulants internally.

The theories advanced by Mr. Kentish, which, however, are very objectionable, lead him to lay down two practical indications, in injuries caused by a pernicious quantity of heat, suddenly applied to a part of the body, and which injuries are attended with increased action. The two indications, for restoring the unity of action, are; first, gradually diminishing the excitement, or action, of the part; secondly, increasing the action of the system to meet the increased action of the part, holding this law as the system in view: *That any part of the system, having its action increased to a very high degree, must continue to be excited, though in a less degree, either by the stimulus, which caused the increased action, or some other having the nearest similarity to it, until by degrees, the extraordinary action subsides into the healthy action of the part.*

With this view, holding the part to the fire seems the best mode of relief; but, as parts of the body are injured, to which this cannot be done, the most stimulant applications must be had recourse to; for, in this class, there is little fear of any of them being greater, than that which originally caused the accident. The strongest rectified spirits, made still stronger by essential oils, are proper, and may also be heated as much as the sound parts can bear. These, and many more applications of the same class, says Mr. Kentish, will give the speediest and most effectual relief. These are only to be continued for a certain time, otherwise they may afterwards cause the very ill they were given to cure. They are then to be succeeded by less stimulant applications, until the parts act by common natural stimuli.

The internal mode of relief is to give those substances, which soonest excite the system to great action, such as æther, ardent spirits, opium, wines, &c. by which means the solution of continuity of action is allowed to continue the shortest time possible, and the unity of action restored, which constitutes the cure.

Suppose, for instance, as a local application, we at first apply the strongest alcohol, heated to the degree, which the sound part would bear without injury: it should afterwards be gradually diluted until it becomes proof-spirit, and the heat should be diminished, although gradually, as cold is always pernicious, bringing on that tendency to shiver, which should ever be continually guarded against, as being a most hurtful symptom, and the fore-runner of a violent sympathetic fever. To prevent this, the external heat should be kept at a high temperature, and the action of the whole system in as great a degree, as may be safe. By this means, you make the action of the whole meet the increased action of the part, by which, the lessening of the increased action of the part to join the action of the whole, is rendered more easy. Thus, there is, says Mr. Kentish, a unity of intention by both the external and internal means, which leads to the restoration of the unity of action, and thus is the cure performed.

It may be said, these circumstances can only take place when there is an increased action, and, that when the parts are destroyed, other means should be used, such as emollients, &c. In replying to this remark, Mr. Kentish distinguishes burns into two kinds; one, in which the action of the part is only increased; and, another, in which some parts have increased action, while other parts are destroyed. It is of little consequence, says Mr. Kentish, what is applied to the dead

part, as the detachment of an eschar depends upon the action of parts, which remain alive, and not upon what is applied to those, which are dead. Mr. Kentish remarks, however, that he never saw an instance of a burn, in which, though some parts were totally destroyed, there were not always other parts, in which there was only increased action. Now as our duty is always to save living parts, our mode of cure, in the first instance, will always be the same, viz. to cure the parts, which have only an increased action, in the doing of which the dead parts will not be the worse, as their separation is a process of the system, which requires time, and, if the injury is to any extent, draws forth the joint efforts of the system, and even, says Mr. Kentish, calls up all the energy of its powers, to violent fever. This state should be supported by every artificial aid, in order to bring the parts to suppuration, otherwise the subject falls in the contest; for, if the living parts have not the power to throw off the dead, the dead will assimilate the living to themselves, and a mortification ensue.

When the living parts have been preserved, (continues Mr. Kentish,) which, according to this treatment, will be in the course of two or three days, the dead parts will be more plainly observed, and the beginning of the process to throw them off will be commencing. This process must be assisted by keeping up the powers of the system against debility, by stimulant medicines and a generous diet. The separation of the eschars will be greatly promoted by the application of the stimulus of heat, by means of cataplasms frequently renewed. These may be made of milk and bread, and some camphorated spirit, or any essential oils, sprinkled upon the surface. Such means need only be continued, until the suppuration is established, as then a different mode must be pursued.

After Mr. Kentish had supported the system to a suppuration, he then found that, gradually desisting from his stimulant plan, diminished the secretion of pus, and wonderfully quickened the healing process.

Thus we see, observes Mr. Kentish, the whole of the former treatment inverted. The most gentle soothing means were used externally and internally; these were continued until suppuration took place; and then the system was excited, under an idea of supporting it, which not unfrequently so fatigued the constitution, as to induce a hectic fever. The present mode is the reverse of this. When a part of the frame has been much excited, this part is not allowed to cease to act for want of stimulus, but, is kept in action

by an adequate stimulus, which is to be gradually diminished, until the ordinary action returns. With the same view, the internal means are highly stimulant to the whole system, which must be supposed to be in a natural state at the time of the accident.

Thus increasing the action of the whole by strong stimuli, and decreasing the action of the part, by lessening the stimuli, the desired end will be more readily obtained; that is, equilibrium of the action will be restored.

When parts are destroyed, there must be other parts with increased action; and the foregoing mode will be the best for restoring the living parts, and promoting the separation of the dead ones. Suppuration having taken place, the exciting of the system by any thing stimulant, either by food, or medicine, should be cautiously avoided. Should the secretion of pus continue too great, gentle laxatives, and a spare diet, are indicated. If any part, as the eyes, for instance, remain weak, with a tendency to inflammation, topical bleedings, or small quantities of blood taken from the arm, are useful. To defend the new skin, camphorated oil, or camphorated oil and lime-water, in equal parts, are good applications. Wounds of this kind heal very fast, when the diminution of pus is prevented, by attention to diet: if necessary to keep up the patient's strength, small doses of bark, taken two or three times a day, in some milk, will answer that purpose, and will not excite a quickened circulation, as wine, ale, or spirits, are apt to do. By attention to these principles, (continues Mr. Kentish,) I can truly assert, that I have cured very many extensive and dangerous burns and scalds, in one, two, three, and four weeks, which in the former method would have taken as many months; and some, which I believe to have been incurable by the former method.

After explaining his principles, Mr. Kentish takes notice of the several substances, which have commonly been employed. Of these he would chiefly rely on alcohol, the fluid volatile alkali, æther (so applied as to avoid the cooling process of evaporation,) and spirit of turpentine.

In applying these, we are directed to proceed, as follows: the injured parts are to be bathed, two, or three times over, with spirits of wine, spirits of wine with camphor, or spirit of turpentine, heated by standing in hot water. After this, a liniment, composed of the common yellow basilicon, softened with spirit of turpentine, is to be spread on soft cloth, and applied. This liniment is to be renewed

only once in twenty-four hours, and, at the second dressing, the parts are to be washed with proof spirit, or laudanum, made warm. When a secretion of pus takes place, milder applications must be made, till the cure is effected.

The yellow ointment stops the pores of the cloth, impedes evaporation, and thus confines the effect of the alcohol to the burnt surface. The first dressings are to remain on four and twenty hours. Mr. Kentish thinks it of importance, that the injured surface should be left uncovered, as little as possible. It is, therefore, recommended, to have plasters, ready spread, before removing the old ones, and then only to take off one piece at a time.

It will seldom be necessary to repeat the application of alcohol a second time, or that of oleum terebinthinæ. The inflammatory action will be found diminished, and, according to Mr. Kentish's principles, the exciting means should therefore be diminished. Warm proof-spirits, or laudanum, may be substituted for the alcohol, and the unguentum resinæ flavæ is to be mixed with oleum camph. instead of turpentine. If this should be found too irritating, Mr. Kentish recommends ung. saturn. or cer. lap. calaminaris. Powdered chalk is to be used to repress the growth of exuberant granulations, and to absorb the pus. In the cavities, of separated eschars, and in the furrows, between sloughs, and the living parts, he introduces powdered chalk. Then a plaster is applied, and, in tedious cases, a poultice over the plaster.

With respect to the internal treatment, the author observes, that great derangement of the system arises in certain persons, from causes, which, in others, produce no effect; and that this depends on a difference in the degree of strength. Hence, he concludes, that as strength resists the sympathetic irritative actions of parts, and weakness induces them, we should, in all cases, make the system as strong as we can, immediately upon the receipt of the injury. In considerable burns, he supposes a disproportion of action to take place, between the injured parts, and the system at large, or what, he styles, a solution of the continuity of action; and, that, by a law of the system, a considerable commotion arises, for the purpose of restoring the equilibrium, or enabling the constitution to take on the action of the part. Hence, Mr. Kentish is of opinion, that the indication is to *restore the unity of action of the whole system, as soon as possible*, by throwing it into such a state as to *absorb the diseased action*, and then gradually bring down the whole to the natural standard of action by nice-

ly diminishing the exciting powers. Æther and alcohol, or other stimulants, are to be immediately given, in proportion to the degree of injury; and repeated, once or twice, within the first twelve hours, and, afterwards, wine or ale is to be ordered, till suppuration takes place, when it will be no longer necessary to excite the system.

In a second essay, on the subject of burns, Mr. Kentish remarks, that in the first species of burns in which the action of the part is only increased, he has not found any thing better, for the first application, than the heated oleum terebinthinæ, and the digestive, thinned with the same. In superficial burns, when the pain has ceased, it will be advisable to desist from this application in about four and twenty hours, as that time in many cases will be sufficient, and, at the second dressing, a digestive, sufficiently thinned with common oil, will be adequate to the case, and, on the third day, we are to begin with the ceratum lap. calaminaris. Mr. K. has frequently seen secondary inflammation excited by the remedy. The most certain remedy, for this unpleasant symptom, is to apply a digestive thinned with oil, or a plaster of cerate, and over that a large warm poultice. The cerate will finish the cure. Should there be much uneasiness of the system, an anodyne, proportioned to the age of the patient, should be given.

The growth of fungus, and the profuse discharge of matter, are to be repressed, as already mentioned, by sprinkling powdered chalk on the surface, and by the use of purgatives, in the latter stages. The chalk must be very finely levigated.

Mr. Kentish's theories are, certainly, visionary; they may amuse the fancy, but, can never improve the judgment. He is a man, however, who has had superior opportunities of observing this part of practice, and the great success of his plan of treatment has acquired very extensive approbation, although there are still many practitioners, who prefer the common methods, and the antiphlogistic principles. See *B. Bell's System of Surgery; Medical Facts and Observations, Vol. 2; Richter's Anfangsgrunde der Wundarzneykunst, Band 1. Earle's Essay on the Means of lessening the Effects of Fire on the Human Body. Kentish's Two Essays on Burns. Larrey, Mémoires de Chirurgie Militaire, Tom. 1, p. 93—96.*

BURSÆ MUCOSÆ. These are small membranous sacs, situated about the joints, particularly the large ones of the upper and lower extremities. For the most part, they lie under tendons. The celebrated Dr. A. Monro, of Edinburgh,

published a very full account of the *bursæ mucosæ*, and also of their diseases. These parts are naturally filled with an oily kind of fluid, the use of which is to lubricate surfaces, upon which the tendons play, in their passage over joints. In the healthy state, this fluid is so small in quantity, that it cannot be seen without opening the membrane containing it; but, occasionally, such an accumulation takes place, that very considerable swellings are the consequence. Tumours of this sort are often produced by bruises and sprains, and, now and then, by rheumatic affections. These swellings are not often attended with much pain, though, in some cases, it is very acute, when pressure is made with the fingers. The tumours yield, in a certain degree, to pressure; but, they rise again, with an appearance of elasticity, not remarked in other sorts of swellings. At first, they appear to be circumscribed, and confined to a small extent of the joint; but sometimes, the fluid forming them, is so abundant, that they extend over a great part of the circumference of the limb. The skin, unless inflamed, retains its natural colour.

In this morbid state of the *bursæ mucosæ*, they contain different kinds of fluids, according to the cause of the disease.—When the tumour depends on a rheumatic affection, the contents are ordinarily very fluid. They are thicker, when the cause is of a scrophulous nature. When the disease is the consequence of a bruise, or sprain, the effused fluid often contains hard concretions, and, as it were, cartilaginous ones, which are sometimes quite loose, and more or less, numerous. Such substances may frequently be felt, when the tumour is examined with the fingers.

In practice, such distinctions are not

of much consequence. While the swellings are not very painful, an attempt may be made to disperse them, by warm applications, friction (particularly, with camphorated mercurial ointment,) or blisters, kept open with the *savin cerate*. But, if these tumours should become very painful, and not yield to the above methods, Dr. Monro recommends opening them; a practice, however, which can seldom be really necessary, or proper. This author was continually alarmed at the idea of the bad effects of air admitted into cavities of the body, and hence, in the operation even of opening the *bursæ mucosæ*, he is very particular in directing the incision in the skin, not to be made immediately opposite that made in the sac. Care must also be taken to avoid cutting the tendons, near the swelling.

Dr. Monro has seen cases, in which amputation became indispensable, in consequence of the terrible symptoms following the opening of *bursæ mucosæ*.

On account of such evil consequences, which are imputed to the air, though they would as often arise, where the same practice pursued in a situation, in which no air could have access at all, it has been recommended to pass a seton through the swelling, and to remove the silk, after it has remained just long enough to excite inflammation of the cyst, when an attempt is to be made to unite the opposite sides of the cavity by pressure.

I have never seen any swelling of this kind, which could not be discussed, by the means usually employed for promoting the absorption of other tumours. Indeed, the treatment should be very like that of *Hydrops articuli*. (See *Joints*.)

Consult *Monro's Works by his Son*; and *Latta's System of Surgery*.

C.

CÆSAREAN OPERATION. (Pliny, book 7. of his Natural History, gives us the etymology of this operation.—*Auspiciatus* (says he) *enectâ parente gignitur, sicut Scipio Africanus prior natus, primusque Cesarum à cæso matris utero dictus; quæ ade causâ cæsares appellati. Simili modo natus est Manlius qui Carthaginem cum exercitu intravit.*)

From this passage, we are to infer,

that the Cæsarean operation is extremely ancient, though no description of it is to be found in the works of Hippocrates, Celsus, Paulus Ægineta, or Albucasis. The earliest account of this operation, to be found in any medical work, is that in the *Chirurgia Guidonis de Canhaeco*, published about the middle of the fourteenth century. Here, however, the practice is only spoken of, as proper

after the death of the mother, and is acknowledged to have been adopted, only at such a conjuncture in the case of Julius Cæsar. (See *Cap. de Extractions Fetus.*) Vigo, who was born towards the close of the fifteenth century, takes no notice of the Cæsaean Operation; and Paré, who greatly improved the practice of midwifery, thinks this measure only allowable on women, who die undelivered. (*De Hominis Generatione, cap. 31.*) Rousset, who was cotemporary with Paré, collected the histories of several cases, in which the operation was said to have been successfully performed, and, after, the publication of these, the subject excited more general interest, as we shall presently relate.

By the *Cæsarean operation*, is commonly understood that, in which the fœtus is taken out of the uterus, by making an incision into the abdomen, and through the parieties of that viscus. The term, however, in its most comprehensive sense, is applied to three different proceedings. It is sometimes employed to denote the incision, that is occasionally practised on the cervix uteri, in order to facilitate delivery; but this particular method is named the *Vaginal Cæsarean Operation*, for the purpose of distinguishing it from the former, which is frequently called, by way of contrast, the *Abdominal Cæsarean Operation*. With these cases, we have also to class the incision, which is made in the parieties of the abdomen, for the extraction of the fœtus, when, instead of being situated in the uterus, it lies in the cavity of the peritoneum, in consequence of the rupture of the womb, or in the ovary, or Fallopian tube, in consequence of an extra-uterine conception. This last operation, as Sabatier has remarked, is a species of gastrotomy. However, as it is very analagous to the abdominal and vaginal Cæsarean Operations, it can be most conveniently treated of in the present article. Following the plan, adopted by Sabatier, let us commence with the

VAGINAL CÆSAREAN OPERATION.

A variety of causes, says Sabatier, may render this practice indispensable. A scirrhus hardness of the neck of the uterus is the most frequent. When the induration is such, that the cervix cannot become dilated, and the patient is exhausting herself with unavailing efforts, the parts should be divided in several directions. This has been successfully done under various circumstances. Cases have even been met with, in which the cervix uteri presented no opening at all, and yet the preceding operation proved quite effectual. Such is the example, which Doctor Simson has inserted in the

third volume of the Edinburgh Essays. A woman, forty years of age, became pregnant, after recovering from a difficult labour, in which the child had remained several days in the passage. She had been in labour sixty hours; but the neck of the womb had no tendency to dilate. Dr. Simson, perceiving that its edges were adherent, and left no opening betwixt them, determined to practise an incision, with the aid of a speculum uteri. The bistoury penetrated to the depth of half an inch, before it got quite through the substance, which it had to divide, and which seemed as hard as cartilage. As the opening did not dilate, in the efforts, which the woman made, it became necessary to introduce a narrow bistoury, on the finger, in order to cut this kind of ring in various directions. There was no hemorrhage; and the only additional suffering, which the patient encountered, arose from the distention of the vagina. As the child was dead, Dr. Simson perforated the head, in order to render the delivery more easy.

Strong convulsions, at the moment of parturition, may create a necessity for the vaginal Cæsarean Operation. These sometimes subside, as soon as the membranes are ruptured, and the waters discharged, so as to lessen the distention of the womb. However, if the convulsions continue, and the cervix uteri is sufficiently dilated, the child should be extracted by the forceps, or by the feet, according as the presentation may happen to be. On this subject, Baudeloque has recorded a fact, which was communicated to the Academy of Surgery by Dubocq, professor of surgery at Toulouse. The woman was forty years of age, and had been in convulsions two days. She was so alarmingly pale, that she could scarcely be known. Her pulse was feeble, and almost extinct, and her extremities were cold, and covered with a clammy perspiration. The edges of the opening, which was about as large as a crown piece, felt, as it were, callous, and hardly had this aperture been dilated, when delivery took place spontaneously. The child was dead. The symptoms were appeased, and the woman experienced a perfect recovery.

A considerable obliquity of the neck of the womb, combined with a pelvis, of which the dimensions are small, may also be a reason for the performance of the vaginal Cæsarean Operation. Not that such obliquity always occasions that of the rest of the uterus; nor is the neck of this viscus invariably directed towards that side of the pelvis, which is opposite to its fundus, although this is sometimes

the case. In the latter circumstance, as the contractions of the uterus do not produce a dilatation of its cervix, which rests upon the bones of the pelvis, the adjacent part of that organ is dilated and pushed from above downwards, so as to present itself in the form of a round smooth tumour, without any appearance of an aperture. Such a case may have fatal consequences. Baudeloque furnishes us with an instance. A woman, in her first pregnancy, not being able to have the attendance of the accoucheur, whom she wished, put herself under the care of a midwife, who let her continue in labour-pains during three days. When the accoucheur came, on being sent for again, the child's head presented itself in the vagina, covered with the womb. The portion of the uterus, which included the fœtus, was in a state of inflammation. The os tincæ was situated backward, toward the sacrum, hardly dilated to the breadth of a penny piece, and the waters had been discharged a long time. The patient was bled, and emollient clysters were administered. All sorts of fomentations were employed. She was laid upon her back, with her pelvis considerably raised. The accoucheur had much difficulty in supporting the head of the child, and keeping it from protruding at the vulva, enveloped, as it was, in the uterus. Notwithstanding such assistance, the patient died.

So fatal an event, says Sabatier, might have been prevented, by making the woman lie upon the side, opposite the deviation of the uterus, and employing pressure from above. If these proceedings had failed in bringing the os tincæ toward the centre of the pelvis, this opening might have been brought into such position, by means of the finger, in the interval of the pains, and kept so, until it were sufficiently dilated for the membranes to protrude.

This is what was done by Baudeloque in one case, where the womb inclined forward and to the right. The os tincæ was situated backward. The waters escaped, and the head advanced towards the bottom of the pelvis, included in a portion of the uterus. The whole of the spherical tumour, which presented itself, could be felt with the finger; but, no opening was distinguishable; and the swelling might also be seen, on separating the labia from each other, and opening the entrance of the vagina. It became necessary to keep the patient continually in bed, and to have the finger incessantly introduced; but, she was not sufficiently docile to submit to such treatment. Fortunately, the unexpected appearance of

two officers of justice, forty-eight hours after the commencement of the labour, had the effect of making her more manageable. It was time for her to become so; for, the uterus had now become tense, red, and painful. The abdomen was also so tender, that it could scarcely bear the contact of the clothes. Febrile symptoms had begun, and the ideas were beginning to be confused. Baudeloque made her lie down; and he pressed, with one hand, on the abdomen, for the purpose of raising the uterus, while, with the other, he pushed the head a little way back, in order that he might reach the os tincæ, which he now brought with his finger toward the centre of the pelvis, and kept there for some time. The efforts of the patient being thus encouraged, she was delivered in about a quarter of an hour. The infant was of a thriving description, and the case had a most favourable termination.

When the obliquity of the uterus is such, that the os tincæ cannot be found, and the mother and fetus are both in danger of perishing, it is the duty of the practitioner to open the portion of the womb, that projects towards the vulva. Lauerjat met with a case of this description in his practice. A woman, pregnant with her first child, suffered such extreme pain in her labour, that Lauerjat was solicitous to ascertain the real state of things. He was surprised to find the vulva completely occupied by a body, which even protruded externally, and yielded to the pressure of the fingers, except during the labour-pains. In examining this tumour, he could only find at its circumference a cul-de-sac, half an inch deep, without any aperture, through which the child could pass. Other practitioners, who were consulted about this extraordinary case, were also anxious to learn what had happened. They found in the tumour a laceration, which only affected a part of the thickness of its parietes. This laceration was deemed the proper place for making an incision. The operation having been done, the finger was passed into the cavity, in which the child was contained. A large quantity of turbid fluid was discharged. The child presented, and passed through the opening, which had been formed, producing a trivial laceration on the right side. Lauerjat, having passed his hand into the uterus, was unable to find either the os tincæ, or the cervix. No particular indisposition ensued, and the lochia were discharged through the wound, which gradually closed. In the course of two months, the os tincæ and neck of the uterus, were in their natural

position again. (*Lauvexat Nouvelle Methode de Prutiquer l'Operation Cesarienne, Paris, 1788*)

When the case is a scirrhus induration of the cervix uteri, or a laceration of the parietes of this viscus, at the place, where it projects into the vagina, the vaginal Cæsarean Operation appears to be attended with no difficulty. It is performed with a blunt-pointed bistoury, the blade of which is wrapped round with lint, to within an inch of the point. The instrument is to be introduced, on the index finger, into the opening presented by the uterus, and the aperture is to be properly enlarged, from within outwards, in various directions. But when the scirrhus hardness of the cervix presents no opening at all, or when the part of the uterus projecting in the vagina is entire, the incision should be made from without inwards, with the same kind of knife. Too much caution cannot be used in introducing the instrument, in order that no injury may be done to the child, which lies directly beyond the substance, which is to be divided. No general direction can here be offered, except that of proceeding slowly, and of keeping the index finger extended along the back of the knife, so that it may be immediately known, when the instrument has cut through the substance of the womb, into the cavity of which the finger ought to pass as soon as the knife. If it should be necessary to extend, or multiply the incisions, the cutting instrument should be regulated, in a similar manner, with the same finger. The cervix uteri having been divided, the expulsion of the child is either to be left to nature, or to be promoted by the ordinary means. The operation, that has been described, requires no dressings. However, if the bleeding should prove troublesome, we are recommended to apply to the incision a dossil of lint, wet with vinegar, or spirit of wine. (See *Sabatier's Médecine Opératoire, Tom. 1.*)

ABDOMINAL CÆSAREAN OPERATION.

This is a far more serious operation, than that which we have just now been treating of, and it is the proceeding, to which the term Cæsarean Operation is more particularly applied.

There are three cases, in which this operation may be necessary. 1. When the fœtus is alive, and the mother dead, either in labour, or the last two months of pregnancy. 2. When the fœtus is dead, but cannot be delivered in the usual way, from the deformity of the mother, or the disproportionate size of the child.

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3. When both the mother and child are living, but delivery cannot take place from the same causes, as in the second instance.

Both the mother and child, if accounts can be credited, have often lived after the Cæsarean operation, and the mother even borne children afterwards. Heister gives a relation of such success, in his *Institutes of Surgery*, cap. 113. See also *Mem. de l'Acad. de Chirurgie, Tom. 1, p. 623, Tom. 2, p. 308, in 4to. Edinb. Med. Essays, Vol. 5, art. 37, 38, and Edinb. Med. and Surgical Journal, Vol. 4, p. 179.*

In England, the Cæsarean operation has almost always failed. Mr. James Barlow, of Chorley, Lancashire, succeeded, however, in taking a fœtus out of the uterus by this bold proceeding, and the mother was perfectly restored to health. (See *Haighton's Enquiry concerning the true and spurious Cæsarean operation, and Barlow's account in the Med. Reports and Researches, 1798.*)

This is the only woman, who in this country has had the good fortune to survive the Cæsarean operation, though it is said, that there are eighteen examples recorded, in which it has been performed in Great Britain. Ten of the children, however, are stated to have been saved. On the continent, the practice has proved infinitely more successful; for, of 231 cases of this operation, to be found in the records of medicine, 139 are said to have terminated successfully. (*Kellie, in Edinb. Med. and Surgical Journal, Vol. 8, p. 17.*)

When the fœtus is contained in the womb, and cannot be expelled, by reason of the invincible obstacles already mentioned, the Cæsarean operation should be practised, before the mother, and fœtus, both perish from the violence of the pains, hemorrhage, convulsions, &c.

For this purpose, it is necessary to make an extensive incision in the integuments of the abdomen, and in the uterus. Some have thought, that cutting the parietes of the belly was mortal, while others have believed a wound of the uterus to be so. Hence, such persons have condemned the operation on the principle, that religious reasons do not authorize taking one life to save another. All the opponents of the Cæsarean operation fear the hemorrhage, which, they say, must follow. Indeed, if the uterus were not to contract sufficiently, when the fœtus and after-birth have come away, the bleeding would really be perilous. But when, by means of the Cæsarean operation, the fœtus is extracted, together with the placenta and membranes, the uterus will then contract, just

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as it does after a natural labour. Besides, even when the mother is alive, the operation is not commonly done, till the uterus evinces a propensity to deliver itself, and begins to contract. The womb being delivered of its contents, the incision becomes closed, the vessels obliterated, and there is no fear of hemorrhage. The wound must also make so irritable an organ more disposed to contract; but, whatever arguments may be adduced, it is enough to say in this case: *Artem experientia fecit, exemplo monstrante vivam.* Rousset, in 1581, published a work, in French, intitled, *Hystérotomie, ou l'Accouchement Césarien.* This book, in 1601, was translated into Latin, and enlarged with an appendix by the celebrated Bauhin. Even then, the practice of the Cæsarean operation on the living mother had its defenders. Bauhin relates that, in the year 1500, a sow-gelder performed the Cæsarean operation on his wife, *tam feliciter, ut ea postea gemellos et quatuor adhuc infantes enixa fuerit.* This is said to be the first instance, in which the operation was ever done on the living mother with success. Many other cases were afterwards collected, and published.

The possibility of operating successfully on the living mother has been demonstrated, with so much perspicuity and accuracy, by M. Simon, in *Tom. 1, de l'Acad. de Chirurgie*, in 4to. that there cannot be a doubt of the thing having been frequently practised with success. Here we are presented with a collection of sixty-four Cæsarean operations, more than a half of which had been done on thirteen women. Some of these had undergone the operation once, or twice; others five or six times. There was one woman in particular, who had undergone it seven times, and always with success. This seems to prove, notwithstanding all assertions to the contrary, that the operation, for the most part, succeeds. But, if the life of the mother should not invariably be preserved, the Cæsarean operation ought not to be rejected on this account; it ought always to be done, when relief cannot be obtained by other means; just as amputation and lithotomy are practised, though they are not constantly followed by success. Would any thing be more cruel, than to abandon a mother and her child, and leave them to perish, while there is any hope of saving them both? It is true, that when a pregnant woman dies of any inward disorder, and not from the pains, and efforts of labour, the fœtus is sometimes still alive in the uterus; but, in cases of death, after difficult labours, and the great efforts, made by the uterus to overcome the obstacles

to parturition, the fœtus is generally dead, and the operation therefore is less likely to be availing. (See *Bertrand's Traité des Opérations de Chirurgie*, Chap. 5.)

It is the opinion of the best writers upon this subject, that whenever a woman dies, at all advanced in pregnancy, the performance of the Cæsarean operation is highly proper. Experience has proved, that when the fœtus has not attained the period, at which parturition commonly happens, it will sometimes survive the operation a considerable time, and that, when it is full grown, its life may be most happily preserved. Although instances are cited, in which the fœtus in utero has been found alive upwards of four and twenty hours after the death of the mother, little stress should be laid on such prodigies. The operation ought to be done without any delay. Even then, we are not certain of saving the infant's life. The greater number of fœtuses perish at the same time as the mother, and from the same causes. If the mother should happen to die in labour, and the neck of the uterus were sufficiently dilated, or disposed to be so, an attempt should be made to accomplish delivery in the ordinary way; for, examples have occurred, in which, women, supposed to be dead in this circumstance, were in reality alive. Hence, we find, that the senate of Venice formerly enacted a law, by which practitioners were liable to punishment, in case they neglected to operate with as much caution on a pregnant woman, supposed to be dead, as on the living subject. (*Richerand, Nosographie Chirurgicale*, *Tom. 4, p. 395, Edit. 2.*) In the *Journal de Savans de Janvier*, 1749, the following case, confirming the propriety of such caution, was inserted by M. Rigaudeaux, surgeon to the Military Hospital at Douay. This practitioner, having been sent for to a woman, to whose residence he was unable to proceed, till two hours after her apparent death, he had the sheet, with which she was covered, removed, and perceiving that the body retained its suppleness and warmth, he tried whether the fœtus could not be extracted in the ordinary way, which was easily effected as soon as the feet were got hold of. The first endeavours to save the child, were very unpromising; but, after a few hours, they had the desired effect. As the woman continued in the same state, five hours afterwards, Rigaudeaux recommended, that she might not be buried, before her limbs were quite cold and stiff. He afterwards had the satisfaction to learn that she was also restored to

life. This remarkable case happened on the 8th of June, 1745, and both the mother and child were living, at the period, when Rigaudeau published the observation.

Supposing, however, delivery in the ordinary manner to be impracticable, at all events, the Cæsarean operation ought to be performed, with the same cautions, as if the mother were alive, only one incision being made for the purpose of opening the uterus.

Almost all the insurmountable obstacles to delivery originate from the bad conformation of the pelvis, which depends upon rachitis; though it is not an invariable consequence of it, since there are women, extremely deformed, in whom no imperfection of the pelvis exists, while it prevails in others, whose shape is but trivially disfigured. An examination of the dimensions of the pelvis is the right mode of ascertaining, whether there is really such an impediment to parturition. In order that the dimensions may not be an obstacle to delivery, the distance, between the upper edge of the sacrum and the os pubis, ought to be three inches and a half; and the distances, between the tuberosities of the ischium, and between each of these protuberances and the point of the os coccygis, three inches. Women have indeed been known to be delivered, without assistance, although the first of the above distances, was only two inches and a half; but, then the heads of the children were so elongated, that the great diameter was nearly eight inches, while that, which extends from one parietal protuberance to the other, was reduced to two inches five or six lines, and the infants were lifeless. If they are to be born alive, they must be taken out of the womb by the Cæsarean operation; but, the latter proceeding should never be adopted, without a certainty, that they are actually living; for, when dead, they may be extracted in a way, that is attended with much less risk to the mother.

It is not always an easy matter to ascertain with certainty, whether a fœtus in utero, be living, or dead. If it has entirely ceased to move, after being affected with a violent motion, the probability is, that it is no longer alive. But, to be certain, manual examination is necessary, which may be practised in two ways. One consists in pressing upon the uterus, through the parietes of the abdomen. If the child lives, such pressure makes it move, and the motion can be plainly felt, and distinguished. In the other method, one hand is employed in pressing upon the uterus externally, while,

with the fingers of the other hand, passed up the vagina, corresponding pressure is also to be made. The uterus is likewise to be allowed to descend as far as possible, in order to induce the fœtus to move. When no decisive indications can be thus obtained, it becomes necessary to rupture the membranes, if they have not already given way, introduce the hand into the uterus, and put a finger into the child's mouth, for the purpose of making it move its tongue. The finger may also be applied to the region of the heart, so as to examine, whether this organ is beating; and the umbilical cord may be touched, in order to ascertain, whether there is still a pulsation in it. When none of these proceedings furnish unequivocal information, the conclusion is, that the child is dead, and its extraction is indicated, unless the narrowness of the parts be such, that the hand cannot be passed into the uterus, in which case, the Cæsarean operation is indispensable.

But, how are we to form a judgment respecting the dimensions of the pelvis? And how can we know, whether that diameter, which extends from the upper edge of the sacrum to the os pubis, is long enough to allow the passage of the child? The proper conformation of this part is known, by the roundness and equality of the hips, both in the transverse and perpendicular direction; by the projection of the pubes; by the moderate depression of the sacrum; by an extent of four or five inches from the middle of this depression to the bottom of the os coccygis; by an extent of seven or eight inches from the spinous process of the last lumbar vertebra to the highest part of the mons veneris, in a woman moderately fat; and by there being an interspace of eight or nine inches, between the two anterior superior spinous processes of the ossa ilium.

These general calculations, however, are insufficient. In order to acquire more correct opinions, double compasses must be used. The branches of the first being applied to the top of the sacrum, and middle of the mons veneris, three inches are to be deducted from the dimensions, indicated by the instrument; viz. two inches and a half for the thickness of the upper part of the sacrum, (which is said to be constant in subjects of every size,) and half an inch for that of the os pubis. In women, who are exceedingly fat, some lines must also be deducted on this account. Hence, when the total thickness of the pelvis, measured in this direction, is seven inches, there will remain four for the distance from the upper part of the

sacrum to the os coccygis, or for the extent of the lesser diameter of the upper aperture of the pelvis.

For taking the measurement internally, a kind of sector was invented by M. Coutouly. It bears a considerable resemblance to the instruments, employed by shoemakers for measuring the feet. It is passed into the vagina, with its two branches approximated, until one arrives opposite the anterior and upper part of the sacrum, when the other is to be drawn outward, so as to be applied to the pubes. The distance, between the branches, is judged of by the graduations on the instrument. This was named by its inventor a pelvimeter. According to M. Sabatier, it is not always easy to place it with accuracy; its employment is attended with some pain; and there are particular cases, in which it cannot be used.

Instead of this contrivance, the celebrated Baudeloque has recommended a means, which seems to be very safe and simple. The index finger of one hand is to be introduced into the vagina to the upper part of the projection of the sacrum. The finger, having the radial edge turned forwards, is then to be inclined anteriorly till it touches the arch of the pubes. The point of contact being then marked with the opposite hand, the length from the point in question to the end of the finger is to be measured. This length, which indicates the distance between the sacrum and the bottom of the symphysis pubis, usually exceeds that of the lesser diameter of the pelvis by about six lines. Baudeloque acknowledges, that this measurement is not exactly accurate; but, he believes, it will do very well, because, unless the narrowness of the pelvis be extreme, two, or three lines hardly make any difference in the facility of parturition.

The pelvis may be everywhere well formed, and yet present an insurmountable obstacle to delivery, in case an exostosis, lessening its dimensions, should exist on one of the bones, which compose this part of the skeleton. Pineau met with a case of this description in a woman, who died undelivered. The tumour originated from one of the ossa pubis. A steatomatous swelling, situated with the head of the child in the upper aperture of the pelvis, might produce the same effect, unless it were detected, and could be pushed out of the way, so as to make room for the fœtus to pass. Baudeloque mentions a swelling of this kind. It was six or seven inches long, and an inch and a half in width. The extremity of it, which was as large as half an hen's egg, had a bony feel, and contain-

ed nine well-formed teeth, the rest of the mass being steatomatous. It had descended into the lesser pelvis, below the projection of the sacrum, and a little to one side. It might have been taken for an exostosis of this last bone. The labour pains continued sixty hours, and the propriety of performing the Cæsarean operation was under consideration. Baudeloque was averse to this proceeding. He recommended turning the child, and extracting it by the feet, because he thought that the pelvis was sufficiently capacious to admit of delivery. The event proved, that it was three inches nine lines, from before backward, and four inches nine lines transversely. The fœtus was soon easily extracted. The assistance of the forceps was necessary to get out the head. The child was still-born. The mother, exhausted with numerous unavailing efforts, only survived between fifty and sixty hours. Baudeloque was of opinion, that a defective regimen also tended to occasion her death.

Among the insurmountable obstacles to delivery may be reckoned such a displacement of the uterus, that this viscus protrudes from the abdomen, and forms a hernia. The records of surgery have preserved some examples of this extraordinary occurrence. Twice has the Cæsarean operation been performed, and, in one of the cases, the woman survived so long, that hopes were entertained of her recovery. Indeed, as Sabatier observes, why should not the operation succeed in such a case, where the uterus is only covered by the integuments, and there is no occasion to cut into the abdomen, just as well as other instances, in which it is indispensable to divide the muscles, and open the cavity of the belly? In the other case on record, delivery was effected in the ordinary way, either by raising the abdomen, and keeping it in this position with towels skilfully placed, or by making pressure on the uterus, which had the beneficial effect of making this organ resume its proper situation.

Having shewn the absolute necessity for the Cæsarean operation, under certain circumstances, it remains to consider the proper time for performing it, the requisite preparatory means, and the method of operating.

With regard to the time of operating, practitioners do not agree upon this point; some advising the operation to be done, before the membranes have burst, and the waters been discharged; others, not till afterwards. The arguments, in favor of the first plan, are, the facility with which the uterus may be opened

without any risk of injuring the fœtus, and the hope that the viscus will contract with sufficient force to prevent hemorrhage. The advocates for the second mode believe, that, in operating after the discharge of the waters, there is less danger of the uterus falling into a state of relaxation, in consequence of becoming suddenly empty after being fully distended, and that this method does not demand so extensive an incision. Hence, they recommend, as a preliminary step, to open the membranes. Whatever conduct is adopted, it is essential, that the labour should be urgent and unequivocal, that the cervix uteri should be effaced, and that the os tincæ should be sufficiently dilated to allow the lochia to be discharged; but, at the same time, says M. Sabatier, if the operation is not to be done till after the escape of the waters, there ought not to be too much delay, lest the patient's strength should be exhausted, and the violent efforts of labour should bring on an inflammatory state of the parietes of the uterus.

The propriety of emptying the rectum and bladder is so evident, that it is unnecessary to insist upon it. This precaution is more particularly requisite in regard to the latter of these viscera, which has been known to rise so much over the uterus, as to conceal the greater part of it. Baudeloque had occasion to remark this circumstance, in a woman, upon whom he was operating. The bladder ascended above the navel, and presented itself through the whole extent of the opening made in the parietes of the abdomen.

The instruments, dressings, &c. which may be wanted, are two bistouries, one with a convex edge, the other having a probe-point; sponges; basins of cold water acidulated with a little vinegar; long strips of adhesive plaster; needles and ligatures; lint; long and square compresses; a bandage to be applied round the body, with a scapulary, &c.

For the purpose of undergoing the operation, the patient should be placed at the edge of her bed, well supported; her chest and head should be moderately raised; her knees should be somewhat bent, and held by assistants, one of whom ought to be expressly appointed to fix the uterus by making pressure laterally, and from above downward, so as to circumscribe, in some degree, the swelling of the uterus, and prevent the protrusion of the bowels. These things being attended to, the integuments are to be divided with the convex edged bistoury to the extent of at least six inches. The place,

and direction of this incision, differ with different operators.

In the most ancient method, it was customary to make the incision between the outer edge of the rectus muscle, and a line, drawn from the anterior superior spinous process of the ilium, to the junction of the bone of the first rib with its cartilage. This cut was begun a little below the umbilicus, and was continued downward as far as an inch above the pubes. After the integuments had been divided, the muscles, aponeuroses, and peritoneum were cut, and the uterus cautiously opened. The left index finger was then introduced into this viscus, the wound of which was dilated by means of the probe-pointed bistoury.

This manner of operating is subject to great inconveniences. The place, where the incision is made, is the situation of muscles, the fibres of which have a different direction, and, on contracting, separate the edges of the wound, and make it gape. The considerable blood vessels, which ramify there, may be the source of perilous bleeding. The bowels can protrude in that situation more readily, than any where else. When the position of the uterus is oblique, and when, consequently, the edges of this viscus are turned forward and backward, and its surfaces to the right and left, the incision will be made in one of the lateral portions of the uterus, where the trunks of its blood vessels are known to be situated, and sometimes even the Fallopian tube and ovary may be cut. The fibres of the uterus are cut transversely, so that the edges of the incision are apt to gape, instead of being in contact. This last circumstance may the more readily permit the lochia to escape into the abdomen, inasmuch as the uterus is cut nearly through its whole length, and there is no cavity, in which they can accumulate, in order to be discharged through the cervix of that organ.

The linea alba has been frequently considered the most eligible place for making the incision. As Sabatier informs us, it was the method adopted by Soleyres, and Deleurye, and it has the recommendation of Baudeloque, because there are fewer parts to be cut, and, when the uterus is exposed, an incision, parallel to its principal fibres, may be made in its middle part. Soleyres thought that this plan of operating originated with Platner and Guérin, a surgeon at Crepi en Valois. Platner says; *Inciduntur juxta lineam albam, plagâ majore quæ ab umbilico ad ossa pubis ferè descendit, tàm abdominis musculi, tàm peritoneum, ubi tandem vitandum ne violetur arteria epigastrica.* M.

Gueñin, in his case, made an incision, six inches long, which began a little above the umbilicus, and extended to within an inch and a half of the pubes. He afterwards divided the fat, muscles, and peritoneum, in order to get at the uterus, the anterior part of which was opened, the wound being made rather in the body, than the fundus of that viscus. Deleurye will not admit, that these writers actually divided the linea alba, because they speak of having cut muscles, which in reality do not exist in that situation; and he attributes the honour of the invention to Varoquier, a surgeon of Lisle, in Flanders; but, the method was known to Mauriceau, as we may be convinced of by the following passage, extracted from the chapter, in which he treats of the Cæsarean operation, "*La plupart veulent qu'on incise au côté gauche du ventre; mais l'ouverture sera mieux au milieu entre les muscles droits, car il n'y a en ce lieu, que les tégumens et les muscles à couper.*" Lauverjat, who has made this remark, and cited the Latin edition of Mauriceau, page 247, also observes, that the incision in the linea alba was practised by a cotemporary of La Motte, a circumstance which Sabatier has not been able to ascertain. (*Médecine Opératoire, Tom. 1.*) The following would be the proper manner of operating in the linea alba. The operator should first divide the integuments perpendicularly, so as to expose the linea alba, making the wound about six inches long. An opening should then be carefully made through the aponeurosis, into the abdomen, either at the upper, or lower part, of the linea alba in view. A curved bistoury is then to be introduced into the opening, and the tendon and peritoneum cut from within outward, as far as the extent of the wound in the integuments. The latter cut should be cautiously made, with the crooked bistoury, guided by the forefinger of the left hand, lest any of the intestines should be accidentally injured. The uterus must next be carefully opened, making an incision in it, of the same length, as the preceding wound. The fœtus is to be taken out through the wound, and then the placenta and membranes. In this way, M. Artiste lately operated, so as to save both mother and child. (See *Edinburgh Surgical Journal, Vol. 4, p. 178.*)

This mode of operating, as Sabatier observes, gives more hopes of success, than the plan first described; but he argues, that such hopes have not been realised by experience. Though the operation may have been more easy, he contends, that the edges of the wound in the skin, and those of the incision in the uterus, have

had no tendency to remain in a state of proximity to each other, because the linea alba is the point, on which all the large muscles of the abdomen principally act, and because the contraction of the uterus invariably takes place from above downwards. Sabatier alleges, the wound in this viscus has been found to incline to one of its sides, for the same reasons, as occur, in operating at one of the sides of the abdomen. He also states, that the incision has been concealed under the integuments of the upper part of the pubes, and that the presence of the bladder hinders the wound from being carried sufficiently far down. Perhaps, says he, a part of these inconveniences, which depend upon the contraction of the uterus, and the return of this organ to its natural state, might be avoided, by extending the incision to its highest part. Baudeloque has advised this plan, with a view of preventing the fatal extravasations in the abdomen, which frequently follow this operation. Sabatier, however, has doubts, whether, in operating in the linea alba, the wound can be carried high enough. Besides, he maintains, that this precaution would not prevent the wound from gaping, nor the greater tendency of the lochia to be extravasated in the abdomen, than to accumulate in the uterus, and be discharged through the os tincæ. (*Médecine Opératoire, Tom. 1, p. 274—275.*)

In this country, (where, indeed the Cæsarean operation, has proved most unsuccessful) the linea alba is preferred, I believe, by the majority of practitioners. That the method is not always attended with the formidable objections, urged against it by Sabatier, is quite certain. The case, lately published by Dr. Chisholm, is a decisive proof of this assertion. (See *Edinb. Med. and Surgical Journal, Vol. 4, p. 178, 179.*)

There is a third method of performing the abdominal Cæsarean operation. It consists in making a transverse incision, five inches in length, through the parietes of the abdomen, between the rectus muscle and the spine, and in a situation more or less high, according to the more or less elevated position of the uterus. This plan was recommended by Lauverjat, in a publication entitled, "*Nouvelle Méthode de Pratiquer l'Opération Césarienne, Par. 1, 1788.*" Lauverjat acknowledges, that the method has been successfully practised by different persons before himself, and, especially, in one instance, which was particularly remarkable, as, in consequence of the first incision having been made too high up, it became necessary to make a second one, which ex-

tended obliquely from the other. However, according to Sabatier, Lauerjat has as much merit, as if he had invented the plan, since he has given a better explanation of its advantages, than any of his predecessors.

The side, on which the operation is to be done, is in itself a matter of indifference. But, if the liver or spleen were to project, one ought to avoid it. Also, if the uterus were to incline more towards one side, than the other, it would be proper to operate on that side, where the uterus could be most conveniently got at. The patient being put in a proper position, and held by assistants, and her abdomen kept steady by an attendant, who must apply the palms of his hands to the sides of the uterus, the integuments, muscles, and peritoneum are to be divided, with the usual precautions. The uterus is then to be opened, and the wound in it enlarged in the requisite degree, by means of a probe-pointed bistoury. Should the placenta present itself, care must be taken not to injure it, for fear of opening one of the arteries of this mass, which communicate with the umbilical arteries of the child, or of leaving a portion of it in the uterus; but, it should be separated, in order to facilitate breaking the membranes at its circumference. The child is next to be extracted. This part of the operation is subject to no general rule. Delivery being accomplished, we are recommended to introduce through the vagina anodyne injections, in order to lessen spasm, and wash out the coagula. This method is preferable to that of clearing out the uterus with the hand. Sabatier most properly condemns the plan, formerly advised by Rousset and Ruleau, of passing up the neck of this viscus a bougie for the purpose of washing out the lochia, as well as the absurd proposal of employing a seton to promote their escape. Should the lochia not pass readily outward, we are recommended to introduce the finger occasionally into the cervix uteri, so as to free it from the coagula, which may obstruct it.

Sabatier observes, that nearly all authors, who have spoken of the Cæsarean operation, whether performed at the sides of the abdomen, or in the linea alba, have advised keeping the edges of the wound in the skin, muscles, and peritoneum together, by means of the interrupted, or twisted suture, care being taken to place at the lower part of the incision, a tent, in order to prevent adhesion, and leave a free issue for whatever discharge may take place from the abdomen. Others have been content with recommending the

use of adhesive plasters and the uniting bandage.

Sabatier condemns sutures as painful and irritating, and he states, that the other means only act upon the skin, without fulfilling the object in view, because the integuments have no fixed point, and the divided muscles tend to contract. Sabatier assures us, that, in the last mode of operating, the edges of the wound may be brought into contact by merely laying the patient upon her side. Besides, he remarks, that there are not many muscular fibres cut, those of the transversalis being only separated from each other. He affirms, that this manner of operating also favours the approximation of the edges of the wound in the uterus, in consequence of this organ, contracting most extensively in the perpendicular direction. It is likewise asserted, that, as the uterus has only been opened at its upper part, it affords in its middle and lower portions a large cavity, which does not communicate with the abdomen, and in which the lochia may easily accumulate, and afterwards be discharged by the natural way. The only dressings, advised by Sabatier, are a large pledget, compresses, and a moderately tight bandage round the body. These are to be changed, when soiled with the matter or discharge. In this country, practitioners would not neglect to bring the edges of the wound, as much as possible together, by means of strips of adhesive plaster; for, though they may not act with so much effect in this situation as many others, they undoubtedly assist in promoting the main aim of the surgeon, which is to heal at least all the upper part of the incision, if possible, by the first intention. I have no doubt, there are many, who would be advocates for sutures. In this country, the last method of operating has also been tried.

Mr. Wood, of Manchester, performed the Cæsarean operation, in a case, in which parturition was prevented by deformity of the pelvis. The incision was made nearly in a transverse direction, on the left side of the abdomen, about five inches in length, beginning at the umbilicus. This part was fixed upon, because the nates of the child could be felt there, and it was evident, that no intestine was interposed betwixt the abdominal parietes and the uterus. There was scarcely any effusion of blood, either from the external wound, or from that of the uterus, though the latter was made directly upon the placenta. Instead of dividing the placenta, Mr. Wood introduced his hand betwixt it and the uterus, and,

laying hold of one of the child's knees, extracted the fœtus with ease. His hand passed with ease, betwixt the placenta and uterus; this produced a hemorrhage, but, not in any considerable degree; for, the whole quantity of blood lost did not exceed seven, or eight ounces. After the uterus was emptied, the intestines and omentum protruded at the wound. These having been reduced, the integuments were brought into contact with sutures and adhesive plaster. This operation, however, did not save the woman's life; she died on the fourth day from the time of its being done. (See *Medical and Physical Journal*, Vol. 6.)

OF OPERATING, WHEN THE FŒTUS IS EXTRA UTERINE.

Delivery cannot possibly happen in the ordinary way, when the fœtus is situated in the ovaries, or Fallopian tube, or in the cavity of the peritoneum. However, there are many instances recorded of ventral pregnancies, which the mothers have survived, the dead putrified fœtus having been discharged, either out of an abscess, or through the rectum.

Practitioners are occasionally called upon to do a very similar operation to the Cæsarean, when the child has passed into the cavity of the peritoneum, in consequence of the rupture of the uterus. Unfortunately, such an accident is not uncommon, and though the causes of it may not be obvious, nothing is more certain, than that the fœtus itself is entirely passive, and has no share in producing the misfortune. The symptoms, by which the event cannot be known, are not always easy of comprehension. When, however, the pains have been violent; when the last, after being excessively severe, has been followed by a kind of calm; when the countenance loses its colour, the pulse grows weak, and the extremities become cold and covered with a cold sweat; when the abdomen is generally flattened, and is only partially affected with a swelling, which is known to be occasioned by the fœtus, which either continues to move, or is dead and motionless; when the patient complains of a moderate degree of heat about the belly; and lastly, when the child shrinks from the touch of the accoucheur; it is manifest that the uterus is lacerated. If the child has passed completely into the abdomen, gastrotomy is the only resource. Should a part of it, however, yet remain in the uterus, it may be extracted, with the aid of the forceps, if the head presents, or by the feet, provided only the upper part of the body be in the abdomen.

Baudeloque quotes three instances of gastrotomy, performed on account of the rupture of the uterus. The first is that inserted by Thibaud Dubois in the *Journal de Médecine* for May, 1760. Every preparation was made for a natural labour, when, after excessively violent pains about the upper and left part of the uterus, the child disappeared. Thibaud opened the abdomen, though not until some hours after the accident. The infant was dead; but, the mother experienced no ill effects after the operation, except such as are usual after ordinary labours.

The second and third cases were communicated to the French Academy of Surgery in 1775, by Lambron, a surgeon of Orleans. He practised the operation twice, on the same woman, with success. In the first instance, he operated eighteen hours after the rupture of the uterus. The child was dead. An ill-conditioned abscess formed near the wound; but, the patient got quite well in the course of six weeks. She was pregnant again the following year, and the uterus was once more ruptured. Lambron now had recourse to the operation without delay. The child betrayed some signs of life; but, soon died. The mother not only survived; but, afterwards became pregnant again, and had a favourable delivery.

A laceration in the uterus, or the wound, made in this viscus in the Cæsarean operation, may give rise to dangerous and even fatal symptoms of strangulation, if any of the intestines insinuate themselves into the preternatural opening. When such an occurrence happens in the performance of the preceding operation, the intestine must be directly withdrawn and replaced. If the accident were to happen, when the child is extracted the natural way, the bowel is to be pushed back into the abdomen from the uterus. Were the occurrence to take place several days after the operation, Sabatier enquires, what ought to be done? A surgeon is said to have pushed back the intestine from the uterus as late as the third day. Sabatier thinks, that later it could not be done. In this circumstance, Baudeloque advises the operation, suggested by Pigrai, namely, that of opening the abdomen and withdrawing the bowel from the place, in which it is incarcerated. But, there are serious objections to this proceeding. There is no certainty that the intestine is strangulated, and if it were so, the adhesions, which are soon formed, would frustrate the operator in his design.

Gastrotomy has not only been recommended for cases, where the child has passed into the abdomen through a rupture of the uterus; it has likewise been

advised for instances, in which the fœtus has grown in the Fallopian tube, ovary or cavity of the abdomen. Here, indeed, the operation deserves to be called Cæsarean; for, in addition to the incision of the skin and muscles of the abdomen, it is necessary to open the pouch, in which the child is contained. The instances of conceptions in the Fallopian tube are not uncommon. Those in the ovary, and cavity of the peritoneum, are more rare. Sabatier conjectures, that most of the cases, reported to be of the latter kind, if attentively examined, would have been found to be in reality conceptions in the Fallopian tube.

Extra-uterine conceptions hardly ever arrive at maturity. However, the fœtus, formed in the Fallopian tube, has sometimes been known to attain the term of nine months, and then die, either from the impossibility of its expulsion, or from the insufficiency of the nourishment afforded it. The pouch, in which it was contained, and the neighbouring parts, have then inflamed, and, after becoming connected together by numerous adhesions, have suppurated. The abscess has burst, partly at some point of the circumference of the belly, and partly, into the rectum; and the dead fœtus has been discharged piece-meal with the matter.

In other examples, the fœtus, instead of giving rise to abscesses, has become ossified, with the enveloping membranes, and continued in this state many years, without any other inconvenience to the patient, than what depended on the size and weight of the tumour within the abdomen.

Most frequently, however, the pouch, containing the fœtus, bursts, about the middle of the ordinary period of gestation, and the child passes into the cavity of the peritoneum. At the same moment, the blood vessels, ramifying on the parietes of the containing parts, usually pour forth into the abdomen so much blood, that the patients generally die in the space of a few hours.

Sabatier acquaints us, that two facts of this kind have fallen under his observation. The women were in the end of the fourth month of pregnancy. Excepting a swelling, which affected only one side of the abdomen, and frequent dragging pains in this cavity, there was no indication of any thing extraordinary. In other respects, the patients were well. They were both, all on a sudden, attacked with extremely acute pains, which lasted two or three hours. A more violent suffering, than the rest, was followed by entire ease. The abdomen subsided, and became as it were flat. An equal moderate warmth

diffused itself over this part of the body. The skin lost its colour. Almost continual syncope occurred. The pulse was feeble and concentrated. The whole body was covered with a cold sweat, and the women died. The rapid course of these symptoms rendered it impossible for Sabatier to be of any assistance. The patients were actually dying, when he was called to them. The examination of their bodies evinced, that the abdomen contained a large quantity of blood; that the children lay on the intestines, connected with the lacerated Fallopian tube by means of the umbilical cord; and that the tube itself, which was strongly contracted, presented no other tumour, except that which depended on the after-birth.

There is nothing, that announces an extra-uterine pregnancy, with sufficient certainty, to justify any positive conclusion, respecting the nature of the case, before the ordinary time of parturition. In many women, the gravid uterus inclines to one side, and numerous pregnant females have dragging pains, which may depend upon other causes. Things, however, are different, when the fœtus has lived to the ordinary period of parturition, and the woman is attacked with labour pains; because, besides the unequivocal signs of the presence of a child in the abdomen, the womb is empty, and is little changed from its common state. Should we now, asks M. Sabatier, have recourse to the Cæsarean operation, just as if the fœtus were in the womb? Can we be sure, that the pouch, which contains the child, will contract itself, like the uterus, and that the incision, which is in contemplation, will not give rise to a fatal hemorrhage? Would it be easy to separate, and remove the whole of the placenta? How could the discharge, analagous to the lochia, find an outlet, and would not, its extravasation in the abdomen, be likely to prove fatal? Sabatier thinks, that the risk, which is to be encountered, is much less, when things are left to nature. The child, indeed, must inevitably perish. It will either give rise to abscesses, with which it will be discharged in fragments, or it will remain for a length of time in the abdomen, without any urgent symptoms. Sabatier also calls our attention to the great precariousness of an infant's life, and expresses his opinion, that, there can be no difficulty in deciding what conduct ought to be adopted. Happily, practitioners are not often placed in circumstances so delicate, and extra-uterine conceptions mostly perish, before the end of the common period of gestation. We have then only to second the efforts

of nature; either by promoting suppuration, if it should seem likely to occur; by making a suitable opening, or enlarging one that may have formed spontaneously; by extracting such fragments of the fœtus as present themselves; by breaking the bones, when their large size confines them in the abscess, as M. Littre did in an instance, where the abscess burst into the rectum; and, lastly, by employing suitable injections. (See *Sabatier's Médecine Opératoire*, Tom. 1.)

Govei, p. 401, relates a case of ventral conception, in which instance the Casarean operation was done, and the child preserved. A lady, aged 21, had a tumour in the groin, which, was at first supposed to be an epiplocele, but an arterial pulsation was perceptible in it. In about ten weeks, the swelling had become as large as a pound of bread. Govei, solicited by the lady, opened the tumour. He first discovered a sort of membranous sac, whence issued a gallon of a limpid fluid. The sac was dilated, and a male fœtus found, about half a foot long, and large in proportion. It was perfectly alive, and was baptized. After tying the umbilical cord, the placenta was found to be attached to the parts just behind, and near the abdominal ring; but it was easily separated. Govei does not mention whether the mother survived; but the thing would not be very astonishing, considering the situation of the fœtus. Bertrandi says, he was unacquainted with any other example of the Casarean operation being done, in cases of extra-uterine fœtuses, so as to save both the mother and infant. This eminent man condemned operating, in ventral cases, on the ground that the placenta could not be separated from the viscera, to which it might adhere, or, if left behind, it could not be detached, without such inflammation and suppuration, as would be mortal. But if, in addition to such objections, says Bertrandi, the operation has been proposed by many, and practised by none, we may conclude that this depends on the difficulty of judging of such pregnancies, and of the time when the operation should be attempted. He puts out of the question the dilatations, which have been indicated for extracting dead portions of the fœtus, and also Govei's case, who operated without expecting to meet with a fœtus at all. (*Bertrandi Traité des Opérations de Chirurgie*, Chap. 5.)

Whenever the Casarean operation, or gastrotomy, has been performed, the practitioner is not merely to endeavour to prevent inflammation, heal the wound, and appease any untoward symptoms, which may arise; he should also prevail upon

the mother to suckle the child, in order that the lochia may not be too copious, and, after the wound is healed, she should be advised to wear a bandage, for the purpose of hindering the formation of a ventral hernia, of which, according to surgical writers, there is a considerable risk.

The best sources of information are, *Sabatier's Médecine Opératoire*, Tom. 1. *Recherches sur l'Operation Césarienne* par M. Simon, in *Mém. de l'Acad. Royale de Chirurgie*, Tom. 3, p. 210, &c. and Tom. 5, p. 317, &c. Edit. in 12mo. *Bertrandi Traité des Opérations de Chirurgie*, Chap. 5. *Baudelocque's Traité des Accouchemens*. *Denman's Introduction to Midwifery*. *Hull's Defence of the Casarean Operation*. *Haigh-ton's Enquiry concerning the true and spurious Casarean Operation*. *Edinb. Med. and Surgical Journal*, Vol. 4, p. 178, Vol. 8, p. 11. *Richerand's Nosographie Chirurgicale*, Tom. 4, p. 381, &c. Edit. 2. *Richer's Anfangsgründe der Wundarzneikunst*, Band 7, Kap. 5; Göttingen, 1804.

CALCULUS. (from *calx*, a limestone.) Any stony, or earthy concretion, formed in various parts of the body, is usually so called, as, for instance, calculi in the ducts of the salivary glands, in cases of ranula; calculi in the kidneys, bladder, urethra, gall-bladder, &c. Many of these last concretions, if we were to judge by their chemical composition, seem to ill deserve the name of calculi, or stones. For an account of what are commonly called stones in the bladder, refer to *Urinary Calculi*.

CALCULUS IN THE INTERIOR OF THE EYE. See *Eye*, &c.

CALIGO CORNEÆ. See *Albugo*, *Cornea*, *Opacities of*, *Leucoma*, *Staphyloma*, &c.

CALLOSITY. (from *callus*, q. v.) Preternatural hardness.

CALLUS. (from *calx*, the heel, or *calco*, to tread.) This term used to be applied to the thick skin, at the bottom of the heel, hardened by pressure. In surgery, the meaning of the word *callus* is *new bone*, or the solid substance, which serves to join together the ends of a fractured bone.

The old surgeons believed callus to be a mere inorganic concrete, a fluid poured out from the extremities of the ruptured vessels, which was soon hardened into bone. They always described it, as an "exudation of the bony juice," and imagined that it oozed from the ends of broken bones, as gum from trees, sometimes too profusely, sometimes too sparingly. The reunion of broken bones, and the hardening of callus, they compared with the glueing together of two pieces of wood, or the soldering of a broken pot. (*A. Paré*.) The old surgeons also conceived, that cal-

lus sometimes flowed into the joints, so as to form a clumsy, prominent protuberance. They imagined, that callus was a juice, which congealed at a particular period of time, and they therefore had fixed days for undoing the bandages of each particular fracture. They supposed, that its exuberance might be suppressed by a firm and well rolled bandage, and its knobby deformities corrected by pillows and compresses; that it might be softened by frictions and oils, so as to allow the bone to be set anew. All their notions were mechanical; and their absurd doctrines have been the apology for all the contrivers of machines, from Hildanus down to Dr. Aitken and Mr. Gooch.—(*John Bell's Principles of Surgery, Vol. 1.*)

A bone is a well organized part of the living body; that matter, which keeps its earthy parts together, is of a gelatinous nature. The earthy matter, to which a bone owes its firmness, is deposited in the interstices of the gluten, undergoing a continual change and renovation. It is incessantly taken up by the absorbents, and secreted again by the arteries. It is this continual absorption and deposition of earthy matter, which forms the bone at first, and enables it to grow with the growth of the body. It is this unceasing activity of the vessels of a bone, which enables it to renew itself, when it is broken or diseased. In short, it is by various forms of one secreting process, that bone is formed at first, is supported during health, and is renewed on all necessary occasions. Bone is a secretion, originally deposited by the arteries of the bone, which arteries are continually employed in renewing it. Callus is not a concrete juice, deposited merely for filling up the interstices betwixt fractured bones, but it is a regeneration of new and perfect bone, furnished with arteries, veins, and absorbents, by which its earthy matter is continually changed, like that of the contiguous bone. Indeed, there could be no connexion, between the original bone and callus, were the latter only the inorganic concrete, which it was formerly supposed to be.

Notwithstanding the more accurate opinions now entertained, concerning callus, the supposition is still very common, that the slightest motion will destroy a callus, which is about to form. But, continues Mr. John Bell, it is an ignorant fear, proceeding merely from the state of the parts not having been observed; for, when callus forms, the perfect constitution of the bone is restored; the arteries pour out from each end of a broken bone a gelatinous matter; the vessels, by which that gluten is secreted, expand and multi-

ply in it, till they form, betwixt the broken ends, a well organized, and animated mass, ready to begin anew the secretion of bone. Thus, the ends of the bone, when the bony secretion commences, are nearly in the same condition, as soft parts which have recently adhered; and it is only when there is a want of continuity in the vessels, or when a want of energetic action incapacitates them from renewing their secretion, that callus is imperfectly formed. This is the reason, why in scorbutic constitutions, in patients infected with syphilis, in pregnancy, in fever, or in any great disorder of the system, or while the wound of a compound fracture is open, no callus is generated. (*John Bell's Principles of Surgery, Vol. 1, p. 500, 501.*)

For some time, the secretion of earthy matter is imperfect; the young bone is soft, flexible, and of an organization suited for all the purposes of bone; but, as yet, delicate and unconfirmed; not a mere concrete, like a crystallization of a salt, which, if interrupted in the moment of forming, will never form; not liable to be discomposed by a slight accident, nor to be entirely destroyed by being even roughly moved, or shaken. Incipient callus is soft, fleshy, and yielding; it is ligamentous in its consistence, so that it is not very easily injured; and, in its organization, it is so perfect, that when it is hurt, or the bony secretion interrupted, the breach soon heals, just as soft parts adhere, and thus the callus becomes again entire, and the process is immediately renewed.

In consequence of the above circumstances, if a limb is broken a second time, when the first fracture is nearly cured, the bone unites more easily, than after the first accident; and when broken a third, and a fourth time, the union is still quicker. In these cases, the limb yields, it bends under the weight of the body, which it cannot support; but, without any snapping or splintering of the bone, and, generally, without any overshooting of the ends of the bone, and without any crepitation.

Callus is found to be more vascular, than the old bone. Mr. John Bell mentions an instance of a bone, which had been broken twelve years, before he injected it, yet the callus was rendered very singularly red. When a recently formed callus is broken, many of its vessels are ruptured, but some are only elongated, and it rarely happens, that its whole substance is torn. It is easy to conceive, how readily the continuity of the vessels will be renewed in a broken callus, when we reflect on its great vascu-

larity; and the vigorous circulation, excited by the accident in vessels already accustomed to the secretion of bone. These reasons shew, why a broken, or bent callus, is more speedily united, than a fractured bone. (Observations, connected with the subject of *Callus*, will be found in the article *Fracture*.)

CALOMEL. (Submuriate of mercury; hydrargyri submuriatis, L. P.) Its extensive utility, in numerous surgical diseases, will be conspicuous in an immense proportion of the articles in this work. When prescribed, as an alterative, it is commonly directed in the dose of a grain or two a day; when ordered as a purgative, from three to ten grains are given; and when directed, with a view of exciting a salivation, from two to four or five grains a day may be exhibited conjoined with opium. Calomel, generally speaking, is not an eligible preparation for curing venereal complaints; because, when the doses exceed a certain quantity, they generally affect the bowels.

CALVATA. Blunt, smooth, surgical instruments, such as a probe with a button at the end of it.

CALX CUM KALI PURO. This is the strong kind of caustic, most commonly employed in surgery. It is chiefly used for making the eschars, when issues are to be formed. This is often necessary in cases of diseased vertebræ, white swellings, morbid hip-joints, &c. (See *Vertebræ*.) This caustic is also sometimes used, though not so often as it was formerly, for opening buboes and other abscesses. Some are in the habit of making it into a paste with soft soap; they cover the part affected with adhesive plaster, in which there is a hole of the size of the eschar intended to be made; and into this aperture they press the paste till it touches the skin. A bandage is then applied to secure the caustic substance in its situation, till the intended effect is produced.

The action of the calx cum kali puro, in this way, however, is more inert and tedious, and, perhaps, on this account, more painful upon the whole. Hence, many of the best modern surgeons never adopt this method; but, after covering the surrounding parts with sticking plaster, rub the caustic on the situation, where it is desirable to produce an eschar, till the skin turns brown. The end of the caustic must first be a little moistened.

The calx cum kali puro, is commonly employed also for destroying large funguses.

Before the port-wine injection was found to be the best radical cure for the hydrocele, this caustic was mostly used in this instance. (See *Hydrocele*.) Mr.

Else, in the case alluded to, used to mix the caustic with powdered opium, by which, it is said, though not with much appearance of truth, that the sloughs were made with little or no pain to the patient.

Some assert that the kali purum alone, acts more quickly, than when mixed with quicklime. I have not found this to be the fact, and, after trying both, give the preference to the calx cum kali puro.

CALYPTER. A fleshy excrecence in the situation of the hemorrhoidal veins. A pile.

CAMARO'MA, CAMARO'SIS, or CAMERATIO. A fracture, resembling an arch, particularly, in the skull.

CAMBU'CA. A bubo. An abscess about the pudenda. Also, a boil.

CAMOMILE. *Chamæmelum.* The flowers are bitter and aromatic, and are employed in surgery in fomentations.

CAMPHOR, is used externally, chiefly as a means of exciting the action of the absorbents, and thus dispersing many kinds of swellings, extravasations, indurations, &c. Hence, it is a very common ingredient in liniments. It has also the property of rousing the action of the nerves, and quickening the circulation in parts, on which it is rubbed. For this reason, in paralytic affections, it is sometimes employed.

Perhaps, there is no composition, that has greater power in exciting the absorption of any tumour, or hardness, than camphorated mercurial ointment.

Camphor is often given internally, in delirium, depending on the irritation of local surgical diseases, as we shall have occasion to explain in several parts of this work. It is also a remedy frequently administered in cases of mortification. Some have recommended it, as singularly useful for the relief of stranguries, even those depending on the operation of cantharides. But, although it may occasionally have succeeded, when given with this view, it not only does not always do so, but, it has been known to cause, an opposite effect, sometimes producing great scalding in voiding the urine, and sometimes pains like those of labour. (*Medical Transactions, Vol. 1, p. 470.*)

CAMPULUM. A distortion of the eyelid.

CAMPYLO'TIS. A distortion of the eyelid.

CANCER. (derived from the Latin *cancer*, a crab, to which, a part, affected with cancer, was anciently thought to have some resemblance.) Also called *Carcinoma*.

Practitioners distinguish cancer into two kinds, viz. *occult* and *ulcerated*, or *open*.

No definition can be offered, which is applicable to both, though each of these terms implies the same disease, only in a different stage.

By *occult cancer* is meant a hard, scirrhous tumour, for the most part accompanied with pains, which are lancinating, excessively acute, and recur with more or less frequency. At length, the tumour breaking, is converted into cancer, strictly so called, or the disease in a state of ulceration.

The *occult cancer* is also sometimes termed *scirrhus*, on account of its peculiar hardness.

The female breast, and the uterus, are particularly subject to the disease. The breasts of men are but rarely affected. The testes, lips, (especially the lower one of male subjects,) the penis, the lachrymal gland and eye, the tongue, the skin, (particularly that of the face,) the tonsils, the pylorus, the bladder, rectum, prostate, and a variety of other parts, are recorded by surgical writers as having frequently been the seat of scirrhus and cancer. They seem, however, to have comprehended an immense number of different malignant diseases under one common name, and, in many of the cases called cancerous, there are no vestiges of the true scirrhous structure.

OF SCIRRHUS, OR CANCER, NOT IN THE ULCERATED STATE.

Mr. Abernethy has given a matchless history of this affection, as it appears in the female breast, where it most frequently occurs, and can be best investigated. Sometimes, says this valuable writer, it condenses the surrounding substance, so as to acquire a capsule; and then it appears, like many sarcomatous tumours, to be a part of new formation. In other cases, the mammary gland seems to be the nidus for the diseased action. The boundaries of the disease cannot be accurately ascertained in the latter case, as the carcinomatous structure, having no distinguishable investment, is confined with the rest of the gland. In either instance, carcinoma begins at a small spot, and extends from thence in all directions, like rays from a centre. This is one feature distinguishing this disease from many others, which, at their first attack, involve a considerable portion, if not the whole, of the part, in which they occur. The progress of carcinoma is more or less quick in different instances. When slow, it is in general unremitting. Mr. Abernethy thinks, that though the disease may be checked, it cannot be made to recede by the treatment, which lessens other

swellings. He is not, however, positive on this point; for, surgeons have informed him, that diseases which eventually proved to be carcinomatous, have been considerably diminished by local treatment. With great deference to Mr. Abernethy, we may be allowed to remark in this place, that every tumour, which ends in cancer, is not from the first of this nature, though it has in the end become so; consequently, it may at first yield to local applications, but will not do so, after the cancerous action has commenced. Hence, Mr. Abernethy's opinion, that a true carcinomatous tumour cannot be partially dispersed, at least, remains unweakened by the fact, that some tumours have at first been lessened by remedies, though they have at last ended in cancer. Mr. Home's observations fully prove, what indeed every surgeon has long known, that any sort of tumour may ultimately become cancerous.

Without risk of inaccuracy, we may set down the backwardness of a scirrhous swelling to be dispersed, or diminished, as one of its most confirmed features. This obdurate and destructive disease excites the contiguous parts, whatever their nature may be, to enter into the same diseased action. The skin, the cellular substance, the muscles, and the periosteum, all become affected, if they are in the vicinity of cancer. This very striking circumstance distinguishes carcinoma, says Mr. Abernethy, from several other diseases. In what this author calls *medullary sarcoma*, the disease is propagated along the absorbing system; but the parts immediately in contact with the enlarged glands do not assume the same diseased actions. Neither in the *tuberculated* species does the ulceration spread along the skin, but destroys that part only covering the diseased glands. Mr. Abernethy acquaints us, that Mr. Hunter took notice, that a disposition to cancer exists in the surrounding parts, before the actual occurrence of the diseased action. Hence arose the following rule in practice: *That a surgeon ought not to be contented with removing merely the indurated, or actually diseased part, but that he should also take away some portion of the surrounding substance, in which a diseased disposition may probably have been excited.* In consequence of this communication of disease to the contiguous parts, the skin soon becomes indurated, and attached to a carcinomatous tumour, which, in like manner, is fixed to the muscles, or other part, over which it was formed.

As a carcinomatous tumour increases, it generally, though not constantly, becomes unequal upon its surface, so that this in-

equality has been considered as characteristic of the disease. A lancinating pain is common; but it is not experienced in every case, without exception. It is also a symptom, attending other tumours, which are unlike carcinoma in structure, and it cannot, therefore, be deemed an infallible criterion of the nature of the disease. (*Abernethy.*)

A hard and painful glandular swelling, having a disposition to become cancer, says Richter, is the common, but, inadequate and erroneous definition of scirrhus. The disease is not regularly attended with swelling; sometimes scirrhus parts diminish in size, and shrink. Hardness is not a characteristic property; for, many tumours, which are not scirrhus, are exceedingly indurated. The disease is not always situated in a gland: it oftentimes attacks structures, which cannot be called glandular; and hard glandular swellings are often seen, which do not partake of scirrhus. The disposition to cancer cannot be enumerated among the marks of scirrhus, since it is not discoverable, till carcinoma has actually commenced. Its termination in open cancer, is not an invariable occurrence; and other tumours become cancerous, to which no one would apply the term scirrhus. (*Anfangsgr. der Wundarzn. Band 1.*)

Scientific surgeons ought undoubtedly to have a definite meaning, when they employ the word scirrhus; superficial practitioners do unquestionably use the word most vaguely; and, perhaps, influenced by its etymology, they call an immense number of various morbid indurations scirrhus.

I have always considered scirrhus, as a diseased hardness, in which there is a propensity to cancerous ulceration, and a greater backwardness to recede, than exists in any other kind of diseased hardness, although the skin may occasionally not break during life, and a few scirrhus indurations may have been lessened.

Though Richter states, that this disposition cannot be discovered, till carcinoma has actually taken place; though Messrs. Burns and Home confirm, that other indurations and tumours may terminate in cancer; though Mr. Abernethy shews, that sarcomatous, and encysted tumours may end in most malignant diseases, and such as merit the name of cancer; yet, it is now well ascertained, that in all these instances, the changes, which precede cancerous ulceration, bear no similitude to the genuine scirrhus.

The puckering of the skin, the dull leaden colour of the integuments, the knotted and uneven feel of the disease,

the occasional darting pains in the part, its fixed attachment to the skin above, and muscles beneath, form so striking an assemblage of symptoms, that, when they are all present, there cannot be the smallest doubt, that the tumour is a scirrhus, and that the disease is about to acquire, if it have not already acquired, the power of contaminating the surrounding parts, and the lymphatic glands, to which the absorbents of the diseased part tend.

The truly scirrhus tumour, which is known to be capable of changing into the true open cancer, when allowed to increase in size is known to be hard, heavy, connected with the gland of the breast; and, when moved, the whole gland moves along with it. The structure of a scirrhus tumour in the breast, is different in the various stages of the disease; and a description of the appearances, exhibited in the three principal ones, may give a tolerable idea of what the changes are, which it goes through previous to its breaking, or becoming, what is termed, an open cancer.

When a section is made of such a tumour, in an early stage, provided the structure can be seen to advantage, it puts on the following appearance: the centre is more compact, harder to the feel, and has a more uniform texture, than the rest of the tumour; and is nearly of the consistence of cartilage. This middle part does not exceed the size of a silver penny; and, from this, in every direction, like rays, are seen ligamentous bands, of a white colour, and very narrow; looking, in the section, like so many extremely irregular lines passing to the circumference of the tumour, which is blended with the substance of the surrounding gland. In the interstices, between these bands, the substance is different, and becomes less compact towards the outer edge. On a more minute examination, transverse ligamentous bands, of a fainter appearance, form a kind of net-work, in the meshes of which the new-formed substance is inclosed. This structure accords with what Dr. Baillie describes to be the case, in cancerous diseases of the stomach and uterus. (*Home.*)

In a further advanced stage of the tumour, the whole of the diseased part has a more uniform structure; no central point can be distinguished; the external edge is more defined, and distinct from the surrounding gland; and the ligamentous bands, in different directions, are very apparent, but do not follow any course, that can be traced. (*Home.*)

When the tumour has advanced to what may be called cancerous suppuration, which, however, does not always happen

in the centre, before it has approached the skin, and formed an external sore; it then exhibits an appearance totally different from what has been described. In the centre is a small irregular cavity, filled with a bloody fluid, the edges of which are ulcerated, jagged, and spongy. Beyond these, there is a radiated appearance of ligamentous bands, diverging towards the circumference; but, the tumour, near the circumference, is more compact, and is made up of distinct portions, each of which has a centre, surrounded by ligamentous bands, in concentric circles.

In some instances, the scirrhus has no appearance of suppuration, or ulceration, in the centre, but consists of a cyst, filled with a transparent fluid, and a fungous excrescence, projecting into this cavity, the lining of which is smooth and polished. When a large hydatid of this kind occurs, a number of very small ones have been found, in different parts of the same tumour; and, in other cases, there are many very small ones, of the size of pins' heads, without a large one. These hydatids are certainly, by no means, sufficiently frequent in their occurrence to admit of their forming any part of the character of a cancerous tumour. (*Home's Observations on Cancer.*)

In the fourth chapter of this work, the author relates two cases of hydatids found in the breast. In the first, the contents of the cyst were bloody serum; in the second, a clear fluid. These two cases of simple hydatids in the breast, unconnected with any other diseased alteration of structure, led Mr. Home to consider the hydatids sometimes found in cancerous breasts; and, he believes, that such hydatids are no part of the poisonous disease, but accidental complaints super-added to it; and, since such hydatids do occur in the natural state of the glands, they are much more likely to do so in disease. (*Home.*)

Mr. Home endeavours to define his conception of a cancer, as follows: As cancer is a term, too indiscriminately applied to many local diseases for which we have no remedy, though they differ very much among themselves, it becomes necessary to state what the complaints are, which I include under this denomination. The present observations, respecting cancer, apply only to those diseased appearances, which are capable of contaminating other parts, either by direct communication, or through the medium of the absorbents; and when they approach the skin, produce in it small tumours of their own nature, by a mode of contamination, with which we are at present unacquainted.

There is a disease, by which parts of a glandular structure are very frequently attacked, particularly the os tincæ, the alæ of the nose, the lips, and the glans penis. This has been called cancer, but differs from the species, of which we are now treating, in not contaminating the neighbouring parts, with which it is in contact; and neither affecting the absorbent glands, nor the skin at a distance from it. It is, properly speaking, an eating sore, which is uniformly progressive; whereas, in cancer, after the sore has made some progress, a ridge is formed upon the margin, and the ulceration no longer takes that direction. It also differs from a cancer, in admitting of a cure, in many instances, and under different modes of treatment.

From the facts, which have been stated, (in Mr. Home's case) it appears, that cancer is a disease, which is local in its origin. In this respect, the cases (alluded to) only confirm an opinion very generally received.

Mr. Home endeavours to establish a second point, that cancer is not a disease, which immediately takes place in a healthy part of the body; but one, for the production of which it is necessary, that the part should have undergone some previous change, connected with the disease. In proof of this, Mr. Home adduces the two first cases in his work, and the innumerable instances, in which a pimple, small tumour, or wart upon the nose, cheek, or prepuce, after remaining for ten, fifteen, or thirty years, without producing the smallest inconvenience; but, at the age of sixty or seventy, upon being cut in shaving, bruised by any accidental violence, or otherwise injured, assumes a cancerous disposition.

All the cases of induration of the gland of the breast, or of indolent tumours in it, which have continued for years, without producing any symptom, and, after being irritated by accidental violence, have assumed a new disposition, and become cancerous, admit of the same explanation; and are adduced as so many proofs of the truth of this latter position. (*Home.*)

DISTINGUISHING CHARACTERS OF SCIRRHUS.

A scirrhus induration seldom acquires the magnitude, to which almost all other tumours are liable to grow, when no steps are taken to retard their growth. Many scirrhi are certainly attended even with a diminution, or shrunk state, of the part affected.

Scirrhi are generally more fixed, and less moveable, than other sorts of tumours;

especially, when the latter have never been in a state of inflammation.

With the exception of the fungus hæmatoides, other diseases do not involve in their ravages indiscriminately every kind of structure, skin, muscle, cellular substance, &c. and the integuments seldom become affected, before the distention, produced by the size of such swellings, becomes very considerable. In scirrhus cases, the skin soon becomes contaminated, discoloured, and puckered.

Some few tumours may be harder, and heavier, than a few scirrhus ones; but, the reverse, is commonly the case.

As other indurations, and tumours, may assume the cancerous action, and even end in cancerous ulceration; and, as some true scirrhi, when not irritated by improper treatment, may continue stationary for years; the occurrence of actual carcinoma cannot prove, that the preceding state was that of scirrhus. The only criterion of the latter disease is deduced from the assemblage of characters already specified; for, except the peculiar puckering, and speedy leaden discolouration of the skin, no other appearances, considered separately, form any line of discrimination.

The white ligamentous bands, around a scirrhus, is a very characteristic symptom; but, these cannot be detected, till the disease has been removed. Hence, how manifestly prudent it must be to take away a considerable portion of the substance surrounding a scirrhus tumour! Were any of these white bands left, the disease would inevitably recur.

OF CANCER IN THE STATE OF ULCERATION.

The diseased skin, covering a carcinomatous tumour, generally ulcerates, before the tumour has attained any great magnitude; a large chasm is then produced in its substance, partly by a sloughing, and partly by an ulcerating process. Sometimes, when cells, contained in the tumour, are by this means laid open, their contents, which are a pulpy matter of different degrees of consistence, and various colours, fall out, and an excoriating ichor issues from their sides. This discharge takes place with a celerity, which would almost induce belief, that it can hardly result from the process of secretion. When the diseased actions have, as it were, exhausted themselves, an attempt at reparation appears to take place, similar to that which occurs in healthy parts. New flesh is formed, constituting a fungus of peculiar hardness, as it partakes of the diseased actions, by which it

was produced. This diseased fungus occasionally even cicatrizes. But, though the actions of the disease are thus mitigated; though they may be for some time indolent and stationary; they never cease, nor does the part ever become healthy.

In the mean while, the disease extends through the medium of the absorbing vessels. Their glands become affected, at a considerable distance from the original tumour. They progress of carcinoma, in an absorbent gland, is the same as that, which has been already described. The disease is communicated from one gland to another, so that after all the axillary glands are affected, those, which lie under the collar bone, at the lower part of the neck, and upper part of the chest, become disordered. Occasionally, a gland, or two, become diseased higher up in the neck, and apparently out of the course which the absorbed fluids would take. As the disease continues, the absorbent glands, in the course of the internal mammary vessels, become affected. In the advanced stage of carcinoma, a number of small tumours, of similar structure to the original disease, form at some distance, so as to make a kind of irregular circle round it.

The strongest constitutions now sink under the pain and irritation, which the disease creates, aggravated by the obstruction, which it occasions to the function of absorption, in those parts, to which the vessels leading to the diseased glands belong. Towards the conclusion of the disease, the patient is generally affected with difficulty of breathing, and a cough. (*Abernethy.*)

The edges of a cancerous ulcer are hard, ragged, and unequal, very painful, and reversed in different ways, being sometimes turned upwards and backwards, and, on other occasions, inwards. The whole surface of the sore is commonly unequal: in some parts, there are considerable risings, whilst, in others, there are deep excavations. The discharge, for the most part, is a thin, dark coloured, fetid ichor; and is often possessed of such a degree of acrimony, as to excoriate, and even destroy, the neighbouring parts. In the more advanced stages of the disease, a good deal of blood is often lost from the ulcerated vessels. A burning heat is universally felt over the ulcerated surface; and, this is the most tormenting symptom, that attends the disorder. Those shooting, lancinating pains, which are generally very distressing in the occult state of the complaint, become now a great deal more so. Notwithstanding that cancerous diseases are not always situated in glandular parts, yet the situation of such sores affords some assistance in the diagnosis;

for, six times as many cancerous affections occur in the lips, and female breasts, as in all the rest of the body together. (*B. Bell.*)

Concerning the peculiar state of the parts in cancer, or the proximate cause, many opinions have prevailed. Until lately, the melancholic humour was supposed to be the fluid, which was obstructed, and accumulated, in consequence of which it fermented, and produced a burning ulcer; and whatever promoted the generation of this humour, was currently admitted as a remote cause of cancer.

"Women," says Paré, "are more subject to scirrhus, than men; because their liver is warmer, and their spleen, being weaker, is less able to purge the blood of choler." Grief and chagrin, by promoting the formation of this fiery fluid, were accordingly considered by Heister as very apt to induce the "cancerous diathesis;" and he adds by way of corollary, "old maids, and women, who do not breed, are very subject to cancer in the breast." Some thought that the obstructed humour became charged with an acid, (*Dionis*) and that this produced ulceration. Others conjectured, that by an adustion, or over-coction, it grew sharp and burning. Wiseman thought it more probable, that it might become arsenical. These changes were almost universally believed to depend upon the previous stagnation, in consequence of obstruction; and this leading point has uniformly been insisted upon by every preceding author, whatever may be his particular notion, with regard to the nature of the obstructed fluid, whether bile, blood, or lymph. Even Mr. B. Bell insists fully on the cause of cancer being a mechanical obstruction. Some have asserted, that they have detected little worms in the parts, which, eating them up, produced all the mischief attendant on cancer; and that to their introduction the disease was owing. Others have ridiculously assigned a little wolf in the part, as the cause of the disease! Strange as this doctrine, of living creatures producing cancer, may appear, it is nevertheless adopted by Dr. Adams. (*Observations on Morbid Poisons.*) When hydatids find their way into a solid substance, the consequence, in his opinion, will be cancer; and the success of an operation will, he conjectures, depend, in a great measure, upon these animals being confined in a common cyst, for then they may be all removed; whereas, if they be unconnected, some of the smaller ones may be allowed to remain. From the surface of the cyst, which contains the animal, a fungus shoots out, and this acts, as a barrier, between it and the skin; or, if the animal have been in the stomach, it

separates it from the coats of that viscus, "preventing suppuration in the one instance, and absorption in the other." This suppuration, and "disposition to fungate, before the skin is broken," is, (continues Mr. Burns) if I understand him, produced by the death of the animal; for, says Dr. Adams, "if hydatids possess the principle of vitality, during their transparent state, and their opacity is the effect of the loss of that principle, would they not, in the latter stage, stimulate the part, in which they are situated, to suppuration, as we find the case with the guinea-worm, when dead?"

Concerning the manner, in which these animals produce the symptoms of cancer, we are told, that "this enlargement of a foreign body in a solid substance, and so extremely sensible, as the breast, cannot but be attended with intense pain, and frequent inflammation." A doctrine not far removed, says Mr. Burns, from that taught in the humoral schools, which maintained, that the coagulation, and inspissation of the fluids, distended the follicles of the glands, producing many cavities, and much pain. (See *Burns on Inflammation, Vol. II.*)

We have already stated, that, though hydatids are occasionally found in cancerous tumours, they are not found often enough to make any part of the character of the disease, and they are met with, in cases, in which there is not the least vestige of such disorder.

After cancer had continued some time, it was believed, that the matter was absorbed into the blood, and that all the humours were speedily assimilated. Hence, was explained the fatal and rapid progress of relapses, after an apparent cure. The only effect of absorption, however, is on the lymphatic glands, which intervene betwixt the sore and the heart; for, beyond these, the absorbed matter is changed in its nature and properties. (*Burns.*)

In many instances, cancer is evidently produced by the same causes, which are capable of producing simple inflammation. It is, however, a general opinion, that cancer arises frequently from some unknown and mysterious cause, which we cannot detect, and which, therefore, has been resolved into some constitutional taint, or cancerous ferment. But, so far as we know, the constitution is perfectly healthy, in the commencement of this disease; nor is there the smallest proof, that it resembles scrophula, in depending on any peculiarity of constitution, before the causes operate. Blows, bruises, &c. may give rise to cancer; but, in many instances, there is no evident local cause act-

ing directly on the part. In the breast, cancer frequently commences, without the interference of any topical agent. There is always, however, in these cases, an irregularity, or disappearance of the menses; and the affection of the mamma seems to depend on sympathy between it and the uterus. Certain it is, that cancer is very frequent about the time of life, when the menstrual discharge ceases.

Cancerous diseases are undoubtedly most common in elderly persons; but, no age is exempted from this disease. Mr. Burns mentions his having seen it distinctly marked, and attended with a fatal event, in children of five years old: he mentions two instances of the eye being affected in such subjects, though from the late observations of Mr. Wardrop, we may now reasonably suspect, that these examples were really cases of the fungus hæmatodes.

TREATMENT OF CANCER.

Some have supposed cancers to be a general disorder of the system; while others have regarded them merely as a local affection. This is a point of much importance in practice; for, if cancers are originally only local affections, no objection can be made to extirpating them. They who think, that cancer is a constitutional disease, regard the operation as useless, perhaps hurtful, inasmuch as it may convert a scirrhus into an open cancer, or make the affection occur in some other part.

The best practitioners of the present day, however, have rejected the doctrine of cancer depending on constitutional causes; and, we have stated Mr. Home's sentiments, in opposition to the opinion. When cancer breaks out again, in the same part, after the performance of an operation, it is often owing to some portion of the disease having been blameably left behind, or to the operation having been put off too long. How likely it is, that some of the cancerous mischief may be left unremoved by the operator, is obvious, on considering the manner, in which the white bands, resembling ligament, shoot into the surrounding fat; and that, even the fibres of the muscles, beneath a cancerous disease, are frequently affected. At the same time, it must be allowed, that the disease is sometimes, to all appearances, so freely and completely removed, that its recurrence must perhaps be imputed to the continued operation of the same unknown cause, which originally produced the first cancerous mischief.

Until very lately, the accounts given of the results of operations for cancers, were

so unpromising, that they must have deterred many patients from undergoing a timely operation; which, for cancerous complaints, is the only remedy to be depended on, with which we are as yet acquainted. As Mr. B. Bell remarks, the great authority of Dr. Alexander Monro must have had no inconsiderable influence even with practitioners, in making them much more backward in undertaking the extirpation of cancers, than they otherwise would probably have been. "Of near sixty cancers," says he, "which I have been present at the extirpation of, only four patients remained free of the disease, at the end of two years: three of these lucky people had occult cancers in the breast, and the fourth had an ulcerated cancer on the lip," (*Edinb. Med. Essays, Vol. 5.*) Dr. Monro also observes, that, in those, in whom he saw the disease relapse, it was always more violent, and made a quicker progress, than it commonly did in others, on whom no operation had been performed. Hence, he questions, "whether ought cancerous tumours to be extirpated, or ought the palliative method only to be followed?" and, upon the whole, he concludes against their extirpation, except in such as are of the occult kind, in young healthy people, and that have been occasioned by bruises, or some other external causes.

More modern experience, however, has afforded a very different result, and given ample encouragement to the early performance of an operation, and even to making an attempt to cut away the disease, in every instance, both of the occult, and ulcerated kind, when such a measure can be so executed, as not to leave a particle of the cancerous mischief behind.

Mr. Hill, in 1772, published some valuable remarks on the present subject. At this period, he had extirpated from different parts of the body eighty-eight genuine cancers, which were all ulcerated, except four: and all the patients, except two, recovered of the operation. Of the first forty-five cases, only one proved unsuccessful; in three more, the cancer broke out again in different parts; and, in a fifth, there were threatenings of some tumours, at a distance from the original disease. These tumours, however, did not appear, till three years after the operation; and the woman was carried off by a fever, before they had made any progress. All the rest of the forty-five continued well, as long as they lived; or are so, says Mr. Hill, at this day. One of them survived the operation above thirty years; and fifteen were then alive, although the last of them was cured in March 1761.

Of the next thirty three, one lived only

four months ; and, in five more, the cancer broke out afresh, after having been once healed. The reason, why, out of forty-five cases, only four or five proved unsuccessful, and six, out of thirty-three, was as follows : "The extraordinary success, I met with, (says Mr. Hill) made cancerous patients resort to me from all corners of the country, several of whom, after delaying till there was little probability of a cure by extirpation, or any other means, forced me to perform the operation, contrary both to my judgment and inclination."

Upon a survey in April 1764, made with a view to publication, the numbers stood thus : Total cured, of different ages from eighty downwards, sixty three ; of whom there were then living, thirty-nine. In twenty eight of that number, the operation had been performed more than two years before ; and, in eleven, it had been done in the course of the last two years. So that, upon the whole, after thirty years' practice, thirty-nine, of sixty three patients were alive and sound ; which gives Mr. Hill occasion to observe, that the different patients lived as long after the extirpation of the cancers, as according to the bills of mortality, they would have done, had they never had any cancers, or undergone any operation.

The remaining twenty-five, which complete the eighty-eight, were cured since the year 1764. Twenty-two of these had been cured, at least, two years ; and some of them, it may be remarked, were seventy, and one ninety years old.

In the year 1770, the sum of the whole stood thus : Of eighty-eight cancers, extirpated at least two years before ; not cured, two ; broke out afresh, nine ; threatened with a relapse, one ; in all, twelve, which is less than a seventh part of the whole number. At that time, there were about forty patients alive and sound, whose cancers had been extirpated above two years before.

Mr. B. Bell, who was present at many of these cases, bears witness to Mr. Hill's accuracy ; and, the former very judiciously states, that, "from these and many other authenticated facts, which, if necessary, might be adduced of the success, attending the extirpation of cancers, there is, it is presumed, very great reason, for considering the disease, in general, as a local complaint, not originally connected with any disorder of the system ; and that a general cancerous taint seldom, or perhaps never, occurs, but, in consequence of the cancerous virus being absorbed into the constitution from some local affection. This, in every case of real cancer, or rather in such scirrhusities, as, from their

nature, are known generally to terminate in cancer, should certainly determine us to have recourse to extirpation as early as possible ; and, if this were done soon after the appearance of such affections, or before the formation of matter takes place, their return would probably be a very rare occurrence." (*System of Surgery, Vol. 7.*)

MEDICINES AND PLANTS, WHICH HAVE BEEN TRIED, FOR THE CURE OF SCIRRHUS AND CANCER.

It is a contested point, whether a truly cancerous disease is susceptible of any process, by which a spontaneous cure can be effected. It appears certain, however, that a violent inflammation, ending in sloughing, may sometimes accomplish an entire separation of a cancerous affection, and that the sore, left behind, may then heal. Facts, confirming this observation, are occasionally exemplified in cases, where caustic is used, and accidental inflammations have led to the same fortunate result, as we may be convinced of by examples recorded by Home, Richerand, &c. The latter writer, adverting to the effort, which nature sometimes makes to rid herself of the disease, on the inflammation and bursting of the tumour, takes the opportunity to relate the following case. A woman, aged forty-eight, of a strong constitution, was admitted into the hospital of St. Louis, with a cancerous tumour of the right breast. The swelling, after becoming softer, and affected with lancinating pains, was attacked with an inflammation, which extended to the skin of the part, and all the adjacent cellular membrane. The whole of the swelling mortified, and was detached. A large sore, of healthy appearance, remained after this loss of substance, and healed in two months. (*Nosographie Chirurgicale, Tom. 1, p. 381, Edit. 2.*)

In general, however, it must be confessed, that inflammation, attacking a cancerous disease, renders things worse instead of better, and by converting occult cancers into ulcerated ones, hastens the patient's death, or, at all events, renders his cure more difficult, and forbids any attempts, which, on such a principle, might be made for his relief.

Of the general remedies, narcotics, such as cicuta, opium, nightshade, &c. have been employed with most confidence.

Cicuta owed its reputation to the experimenting talent of Storck, who has written several libelli on this plant. According to him, cicuta possesses very evident powers over cancer, and has cured a great many cases ; but, in less prejudiced hands, it has been found much less suc-

cessful; and even in many of the instances, adduced by Baron Storck, of its utility, it is by no means proved, that the disease was really cancer. The public have now with great reason, very little reliance on this medicine. In cancerous ulceration, Mr. Burns declares, that he never knew cicuta produce even the temporary melioration, which many talk of.

The common way of exhibiting the hemlock is to begin with small doses, and increase them gradually, until they produce vertigo. We may begin with two grains of the extract, or four of the powder, recently prepared, twice, or thrice a day, and the quantity is to be gradually increased. In this way, some patients have at last been able to take an ounce of the extract daily; but, says Mr. Burns, if a much less quantity, than this, produce no good effect, we may consider it as useless to continue a remedy, which, in this dose, must injure the constitution every day that it is continued. On the continent, hemlock has been used in the form of a bath; but, it is so disagreeable, that few will submit to this method.

The belladonna has been much recommended by Lambergen. During its use, he kept the bowels open with clysters, administered every second day. The dose should be, at first, a grain of the dried leaves, made into a pill. This, in the beginning, is to be given in the morning and evening, and afterwards more frequently. The reputation of belladonna has not been supported by much success.

The hyocyamus has often been tried in cancerous cases, and was held in great estimation by the ancients. Mr. Burns says, he has employed it occasionally, but with little effect. The dose, with which you may begin, is two grains of the extract.

The aconitum has also been given; and, as it is a very powerful and dangerous narcotic, a quarter of a grain of the extract is generally the dose, at first. The solanum dulcamara, Paris quadrifolia, Phytolacca, &c. have been recommended; but, they are now hardly ever employed; which is a sufficient proof of their inefficacy. Mr. Burns mentions his having tried the hepatized ammonia, without any benefit. Richter has given the laurus cerasus, but with little success. The dose of the distilled water, being uncertain, four, or five grains of the fresh leaves may be infused in a little water, as a dose.

The digitalis diminishes vascular action, and may act on scirrhi, like abstinence, bleeding, &c. It has, however, no specific virtue in curing cancerous diseases.

Opium is seldom employed, with an intention of curing cancer, although it probably has just as much power of this kind, as other narcotics, which have been more frequently used. For the purpose of lessening the pain of cancerous diseases, however, opium is very freely employed.

Tonics may sometimes improve the general health; but, as they never produce any effect on the local disease, they are now seldom exhibited.

Mr. Justamond thought arsenic a specific for cancers. Future experience has not, however, altogether confirmed the truth of this opinion, though there are many practitioners, who continue to think highly of the efficacy of this mineral in cancerous diseases. Indeed, I am of opinion, that arsenic has greater claims to further trials in these cases, than perhaps any other medicine, that has hitherto been employed. It unquestionably cures numerous ill-looking sores, on the face, lips, and tongue, and is one of the best remedies for noli me tangere. Mr. Hill observes: "Experience has furnished me with some substantial reasons for considering arsenic as a medicine of considerable merit, both with regard to actual cancer and scirrhus, which may one day terminate in that horrible species of ulcer; and although I cannot as yet say it will remove the one, or cure the other, as certainly and safely as mercury commonly does a syphilitic swelling, or open sore, yet, it will, in a great majority of cases, retard the progress of the true scirrhus tumour, and often prevent its becoming cancer. In some, it has appeared to dissipate such swellings completely." (See *Edinb. Med. and Surgical Journal*, Vol. 6, p. 58.)

Mercury, in conjunction with decoctions of guaiacum, sarsaparilla, &c. has been recommended; but, as Mr. Burns very justly remarks, no fact is more certainly ascertained, than that mercury always exasperates the disease, especially, when in the ulcerated state.

The cuprum vitriolatum has been tried; but, it has at this day no fame whatever. The same may be said of muriated barites.

The carbonate (rust) of iron has been extolled, by Mr. Carmichael, for its efficacy in curing cancer. Besides the carbonate of iron, he has prescribed the tartrate of iron and potash, and the phosphate, oxyphosphate, and suboxyphosphate of the metal. Some constitutions can bear these preparations only in small quantities; they affect most patients with constipation, and many with headach and dyspnea. These circumstances, therefore, must be attended to in regulating

the dose. The above gentleman has seldom given less than thirty grains, in divided doses, in a day, or exceeded sixty. He prefers the suboxyphosphate for internal use, and states, that it answers best in small doses, frequently repeated. It should be blended with white of egg. have a little pure fixed alkali added, and then be made into pills with powdered liquorice. Aloes is recommended for the removal of costiveness. When half a grain is combined with a pill, containing four grains of carbonate of iron, and taken thrice a day, the constipation will be obviated. When the internal use of iron brings on headach, difficult respiration, a quick, sometimes full pulse, which is also generally, hard and wiry, excessive languor, lassitude, &c. and such symptoms become alarming, the iron is to be left off, and four grains of camphor given, every fifth hour.

At the same time, that preparations of iron were internally administered, Mr. Carmichael has employed externally, for ulcerated cancers, the carbonate, phosphate, oxyphosphate, and arseniate of iron, blended with water, to the consistence of a thin paste, which was applied once every twenty-four hours. To occult cancers, the same gentleman has applied a solution of the sulphate of iron, $\mathfrak{z}\text{j}$ to lbj of water. The acetite of iron, diluted with eight or ten times its weight of water, was also used. These lotions were put on the part affected by means of folded linen, wet in them, and covered with a piece of oiled silk to prevent injury of the clothes. (See *An Essay on the effects of the carbonate and other preparations of iron upon Cancer, &c.* by Richard Carmichael.)

Many remedies have acquired celebrity in cases of cancer, because very bad and malignant diseases, only supposed to be cancers, have got well, under their use. Such is probably the case with the carbonate of iron.

In some instances, Mr. Justamond used to join the corrosive sublimate with arsenic. Opium, added to both applications, mitigates the pain, without injuring the efficacy of the remedy.

The only mode of treatment, which Mr. Pearson has ever seen do any particular benefit to cancer, is that of keeping the patient on a diet, barely sufficient for the support of life, such as barley-water, alone, tea, &c. Patients, with cancers, receive considerable benefit from being kept strictly on a milk diet.

The old surgeons commonly dressed cancerous sores, with narcotic applications. Vesalius used cloths, dipped in the juice of the solanum; whilst others em-

ployed it mixed with oil of roses, and preparations of lead, and antimony. Others had recourse to the hyocymus; but, of late, the cicuta poultices seem to have superseded most other narcotic applications. These have undoubtedly, in many cases, as Mr. Burns observes, abated the pain, and diminished the fetor; but, this is all which can reasonably be expected; and even this expectation will not always be realized.

Carrot poultices are better, than those of hemlock, as they produce as much ease, and diminish the fetor more powerfully.

The fetor of cancers having been thought to resemble that of the kali sulphuratum (liver of sulphur) and the oxygenated muriatic acid being the best agent for decomposing, and destroying such smell, it has been recommended, as an application to cancerous sores. It may correct the fetor; but, it will never accomplish a cure.

Carbonic acid has been said not only to correct the fetor, but, in some instances, completely to cure the disease. It was long ago, proposed, says Mr. Burns, by M. Peyrille, and, of late, it has again been brought forward by Dr. Ewart. Experience, however, has not shewn, that the efficacy of carbonic acid, in cases of cancer, is very great. Fourcroy remarks: "After the first applications, the cancerous sore appears to assume a more favourable aspect; the sanies, which flowed from it, becomes whiter, thicker, and purer, and the flesh has a redder and fresher colour; but, these flattering appearances are deceitful, nor do they continue long, for the sore speedily returns to its former state, and its progress goes on, as before the application." The best method of applying carbonic acid is, by means of a bladder, the mouth of which is fastened round the sore, with adhesive plaster. The air is introduced by a pipe, inserted at the other end.

Sometimes, the fermenting poultice is employed.

Digitalis, as a local application, is entitled to about as much confidence as cicuta.

Tar ointment, gastric juice, absorbent powders, &c. have been tried; but, without any evident good. (See *Burns on Inflammation*, Vol. 2.)

Mr. Fearon rejects, probably with much reason, all internal remedies, as inefficient in the treatment of cancer; and, he recommends, in the early stages of the complaint, a method of practice founded on his idea of the inflammatory nature of the disease. "In the beginning of scirrhous affections of the breast and testis, the mode I have adopted of taking away

blood, is by leeches repeatedly applied to the parts. In this course, however, I have often been interrupted by the topical inflammation, produced by these animals, around the parts where they fastened. In delicate female habits, I have often lost a week, before I could proceed to the re-application of them. When the symptoms lead me to suspect the stomach, uterus, or any of the viscera, to be so affected, that the complaint either is, or, most probably, soon will become cancerous, I then have recourse to general bleedings. But, whether topical, or general, perseverance for a sufficient length of time, is necessary. Though the pulse never indicated such practice, yet the patients have not suffered by repeated bleedings; on the contrary, when they passed a certain time without losing blood, they felt a return of their symptoms, and, of their own accord, desired to be bled again. To this plan of repeated bleedings, I joined a milk and vegetable diet, avoiding wine, spirits, and fermented liquors." Mr. Fearon used also to keep the belly open, and employ saturnine applications.

From the preceding accounts, we may infer, that scarcely any reliance is to be placed on any known remedy, or plan, in cases of real scirrhi, and ulcerated cancers. The operation is the only rational means of getting rid of the disease; and, to waste time, so as to allow the disorder to increase in a serious degree, merely for the sake of trying a train of unpromising medicines, is a conduct, which is unworthy of a wise surgeon's imitation.

Perhaps, in early cases, it may be right to make trial of arsenic, cicuta, or preparations of iron. But, the practitioner should beware of devoting too much time to medicines, which will in all probability prove inadequate to the object, for which they are exhibited. Mr. Fearon's method seems also warrantable, together with diet merely enough to support life; but the punishment, attending a resignation to this last regimen, would be greater, than that of having the disease cut away, while the chance of efficacy would be much less. Upon the whole, therefore, the operation is what we should generally resort to, as the surest, and the safest means of getting rid of cancerous diseases. As I have before remarked, the operation is always admissible, when every particle of the disease can be removed by it. Even large open cancers, if they can be entirely cut away, are often capable of being effectually cured.

The removal of cancerous disorders even in the slightest and most trivial cases, should be always effected with the

scalpel, in preference to caustic; the use of which, though formerly recommended by some authors, and still adhered to by some, (*Young*) ought, for very obvious reasons, to be entirely laid aside. The irritation generally occasioned by every application of the caustic kind, together with the pain and inflammation, which commonly ensue, are strong objections in cancerous cases. Plunket's remedy, which is chiefly arsenic, is equally objectionable. Nor can you, at once, so certainly extirpate every atom of cancerous mischief with any caustic, as you can with the knife: for, with this, you immediately gain an ocular inspection of the surface surrounding the disease, so as to see and feel whether the disordered parts are completely removed, or whether any portion of the disorder requires a further employment of the instrument. With respect to the pain, that of caustics is infinitely greater, more intolerable, and more tedious, than that occasioned by the knife. When caustic also fails in destroying every particle of the disease at once, it almost always tends to enlarge, in a very rapid way, the original boundaries of the mischief. For an account of the method of removing scirrhi and ulcerated cancers, see *Mamma, Removal of*.

For information on cancer, the reader is particularly referred to *Le Dran's Operations in Surgery*, p. 287, &c. Edit. 2. *B. Bell's Surgery*, Vol. 2. *Justamond on Cancers*. *Hill's Cases in Surgery*. *Pearson on Cancerous Complaints*. *Abernethy's Surgical Observations*, 1804. *Fearon on Cancers*. *B. Bell on Ulcers*. *Home on Cancer*. *Adams on Cancerous Breasts*, and on *Morbid Poisons*. *Medical Museum*, Vol. 1. *London Medical Transactions*, Vol. 1. *Gooch's Med Observations*, Vol. 3. *L'Encyclopédie Méthodique, Partie Chirurgicale. Article Cancer*, in *London Medical Dictionary*, and *Rees's Cyclopædia*. *Practical Observations on Cancer*, by the late *John Howard* *Mémoire Renforcement quelques Vues Générales sur le Cancer*, in *Œuvres Chirurgicales de Desault par Bichat*, Tom. 3. p. 406, &c. *Richerand's Nosographie Chirurgicale*, Tom. 1, p. 377, &c. Edit. 2. *Lambe's Reports of the Effects of a peculiar Regimen in Cancerous Complaints*. *Baillie's Morbid Anatomy of some of the most important Parts of the Human Body*. *The Queries of the Society for Investigating the Nature and Cure of Cancer* may be seen in the *Edinb. Med. and Surgical Journal*, Vol. 2, p. 382, &c. Consult also *Wardrop on Fungus Hematodes*, in which may be seen an interesting comparative view of this last affection and cancer. *Denman's Observations on the Cure of Cancer*, and on *Carmichael's Essay on Cancer*, Edit. 2.

CANCER SCROTI. **CHIMNEY-SWEEPER'S CANCER.** (See *Scro-tum*.)

CANCRENA. (See *Gangrene*.)

CANCRUM ORIS. A deep, foul, irregular, fetid ulcer, with jagged edges, which appears upon the inside of the lips and cheeks, and is attended with a copious flow of offensive saliva. According to Mr. Pearson, this disease is seldom seen in adults; but, most commonly, in children from the age of eighteen months to that of six, or seven years. The gums, as well as the lips and cheeks, are sometimes affected, in which circumstance, the teeth are generally carious and loose. The ulceration is occasionally attended with abscesses, which burst either through the cheek, lip, or just below the jaw. Exfoliations are not unfrequent, and, when the disease is neglected, extensive sloughing sometimes happen.

Living in a marshy situation; unwholesome food; and inattention to cleanliness; are suspected of being conducive to this disorder. The causes of the affliction seem not to be much understood; but, it is remarked, that the disease prevails most in houses, where children are crowded together. It is uncertain, whether the complaint is contagious.

Though children are the usual subjects of this disease, grown-up persons sometimes do not escape its attacks.

The treatment recommended consists, in extracting diseased teeth and loose pieces of bone; directing a milk vegetable diet, with a prudent quantity of fermented liquors; and prescribing bark, sarsaparilla, and elm bark, with mineral acid.

The best external applications are said to be such as diluted mineral acids; burnt alum; the decoctum cinchonæ, with the zincum vitriolatum; tincture of myrrh; lime water, with spirit of wine, &c. (See *Pearson's Principles of Surgery*, Edit. 2. p. 287.)

We cannot conceive it a safe and prudent method to use any preparation of copper, as an application to the ulcer. However, such practice has an advocate in the preceding author.

CANKER OF THE MOUTH. (See *Cancrum Oris*.)

CANNULA. Any kind of small tube, employed for surgical purposes.

CANTHARIDES. (*Lytta*.) Spanish, or French flies, with which the common blistering plaster is made. In surgery, they are also prescribed in incontinence of urine, gleet, &c. The tincture is sometimes used as a liniment for stimulating parts.

CAPELINA. (from *capeline*, a woman's

hat, or bandage, French.) *A reflex bandage.* It is a double-headed roller, about twenty-four feet long, and four inches broad; sometimes narrower. The middle is applied to the occiput, and, after two or three circular rounds, the rollers intersect each other upon the forehead and occiput; then one roller being reflected over the vertex to the forehead, the other is continued in a circular track. They next cross each other upon the forehead, after which the first head is carried back obliquely towards the occiput, and reflected by the side of the other.

The last is continued in a circular direction; but the first is brought again over the sagittal suture, backward and forward, and so continued, till the whole head is covered.

This bandage used to be applied in cases of hydrocephalus; it has no advantage, however, and is now hardly ever used.

CAPILLARY FISSURE. A very minute crack in the skull. The term came into use from the resemblance of such a fracture to a hair.

CAPILLA'TIO. A capillary fissure.

CAPILLITIUM. The disorder of the eyelids, or eyelashes, better known by the appellations of distichiasis, and trichiasis.

CAPISTRATIO. A phimosis, or such a contraction of the orifice of the prepuce, as prevents the patient from uncovering the glans penis.

CAPISTRUM. (*καπιστρον*, from *caput*, the head; as being made to guide and govern the head.) A surgical bandage, somewhat resembling a bridle or headstall. (See *Bandage*.)

CAPULUM. A distortion of the eyelid.

CARBO. See *Carbuncle*.

CARBUNCLE. (from *carbo*, a burning coal.) *Anthrax.* This is a very common symptom in the plague; but comes on also sometimes as a primary disease. The first symptoms are great heat and violent pain in some part of the body, on which arises a kind of pimple, attended with great itching; below which a circumscribed, but very deep-seated, and extremely hard tumour may be felt with the fingers. This tumour soon assumes a dark red, or purple colour, about the centre, but is considerably paler about the edges. A little blister frequently appears on the apex, which, as it occasions an intolerable itching, is often scratched by the patient. The blister being thus broken, a brown sanies is discharged, and an eschar makes its appearance. Many such pimples are sometimes produced upon one tumour, in consequence

of the patient's scratching the part.— (*Bromfield's Observ. Vol. 1.*)

Carbuncles have been distinguished into the *benign* and *malignant* kinds; but, these distinctions appear to be scarcely warrantable, or, at best, they are only founded upon the different degrees of violence, with which the disease makes its attacks. Some carbuncles are said to be *pestilential*, while others are not so. Fortunately, all the cases, which are met with in this country, are of the last sort; for, no opportunities of remarking the pestilential anthrax have occurred in England since the deplorable periods of 1665, and 1666.

The carbuncle sometimes appears in persons affected with putrid fevers, in which case, it is attended with great weight and stiffness of the adjacent parts; the patient is restless and pale, the tongue white, or of a deep red, and moist; the pulse low, urine sometimes pale, sometimes very turbid, with all the other symptoms; in an exaggerated degree, which attend typhoid fevers. The patient often complains much of his head, either from pain, or giddiness. Sometimes, he is drowsy; at other times, he cannot get the least sleep. Occasionally, he is delirious. The case is also apt to be attended with chilliness, or rigors, and profuse perspirations. The patient is sometimes costive, sometimes afflicted with a profusion of stools; he generally complains of loss of appetite, nausea, and vomiting, takes but little nourishment, complains of difficulty of breathing, and is extremely low, with palpitations of the heart, and sometimes faintings. (See *Bromfield's Observations, Vol. 1, p. 122.*)

Sometimes a little slough, of a black colour, appears in the middle of the tumour. This was supposed by the ancients to be a part of the body burnt to a cinder, or hard crust, by the violence of the disease. The carbuncle is considered by some as a sort of gangrenous affection of the cellular substance. (*Latta.*) The progress of carbuncles to the gangrenous state is generally quick. Their size is very various; they have been known to be as large as a plate. Considerable local pain and induration always attend the disease. The skin, indeed, has a peculiar feel, like that of brawn. As the complaint advances, several apertures generally form in the tumour. Through these openings, there is discharged a greenish, bloody, fetid, irritating matter. The internal sloughing is often very extensive, even when no sign of mortification can be outwardly discovered.

If attention is paid to the skin in this case, we shall frequently find some mili-

ary eruptions about the clavicles, the breasts, or other parts of the body; and, towards the latter end of the disorder, a different collection of large pimples will sometimes be thrown out, like the small-pox, and suppurate. Some of these, indeed, are occasionally converted into actual carbuncles. It was this species of anthrax, which was called *malignant*, and, certainly, in any cases, seen in this country, demand this epithet more strongly, than others, it is the instance, the description of which we have just quitted.

The constitution is often so low and exhausted, that death follows. The carbuncle, indeed, is most frequent in old persons, whose constitutions have been injured by voluptuous living, and, hence, we cannot be surprised, that the local disease, influenced by the general disorder of the system, should assume a dangerous aspect.

The degree of peril may generally be estimated by the magnitude and situation of the tumour, the number of such swellings at the same time, the age of the patient, and the state of his constitution.

The duty of a surgeon, in cases of anthrax, may be described in a very few words. With regard to the local treatment of a carbuncle, the grand thing is to make an early and free incision into the tumour, so as to allow the sloughs and matter to escape readily. As much of the contents as possible is to be at once pressed out, and then the part is to be covered with an emollient poultice. Indeed, until the tumour is opened, no applications are more proper than emollient poultices, and, when an incision has been made, they are far preferable to any detersive antiseptic injections, made with bark, tincture of myrrh, &c. or to any lotions made with the sulphates of copper, and zinc, nitrate of silver, &c. fomentations will also be found to afford considerable relief, both before and after an opening has been made. As the discharge is exceedingly fetid and irritating, it will be necessary to put on a fresh poultice two or three times a-day. The use of the poultice is to be continued, till all the sloughs have separated, and the surface of the cavity appears red, and in a granulating state, when soft lint and a pledget of some unirritating ointment should be applied, together with a tow compress and a bandage. The dreadful manner, in which the disease is protracted, by not making a proper opening in due time, cannot be too strongly impressed upon the mind of every practitioner, and it may justly be regarded as a frequent reason of the fatal terminations of numerous cases. Mr. Bromfield

forcibly inculcates this necessity of making, at a proper time, an opening sufficient to draw out the sloughs; for, says he, in case you rely on that opening, which is generally made by nature, the thin matter only will be discharged, and the sloughy membranes will remain, and the orifice close up. (See *Vol. 1, p. 128.*)

It was formerly not an uncommon custom to extirpate carbuncles with the knife, or to destroy them with the actual and potential cauteries. The French were very fond of burning the swelling with a hot iron, the employment of which is sanctioned by Pouteau. (See his *Œuvres Posthumes.*) These methods, having been found cruelly painful, and, in no respect advantageous, have long been branded with the reproaches of all English surgeons. With respect to the constitutional treatment, we should remember, that the disease is for the most part met with in bad constitutions, and in persons who are weak and irritable. Hence, it is only when there is a full strong pulse, and the complaint is just beginning, that bleeding is allowable. Bark and camphor are the internal medicines most commonly needed. The vitriolic acid is also very proper, as well as wine and aromatics. As the pain is very severe, opium is generally an essential remedy. The constitutional treatment is very analogous to that of mortifications, and, for this reason, I do not deem it necessary to enlarge the present article, by expatiating on this part of the subject.

[From repeated experience the application of a blister over the affected part is confidently recommended as the best local remedy for carbuncle. See *Mortification.*]

In many of the southern parts of Europe, a malignant species of carbuncle, appears to be endemic, contagious, and very often fatal. For an account of this form of the disease, I would particularly advise the reader to consult *Richerand's Nosographie Chirurgicale, Tom. 1, p. 125, &c. Edit. 2, and Larrey's Mémoires de Chirurgie Militaire, Tom. 1, p. 104, &c. Bromfield's Chirurgical Cases and Observations. L'Encyclopédie Méthodique, Partie Chirurg. art. Anthrax, Pearson's Principles. Richter's Anfangr. der Wundarzn. Band 1.)*

CARCINOMA. (from *καρκινος*, a crab.) See *Cancer.*

CARIES. (from *καίω*, to abrade.) The clearest way, in which we can convey an idea of caries, is, by comparing it with ulceration of the soft parts, in which we know a breach is produced by the action of the absorbents. All the bones are liable to caries; but the spongy ones are more frequently attacked, than such as are

compact. Hence, the vertebræ, astragalus, and other bones of the tarsus, those of the carpus, the sternum, and the extremities of long bones, are the most common situation of this affection. The bones of young persons are said to be more frequently carious, than those of old subjects.

Many authors have confounded caries with necrosis, which they have called dry caries. Others have considered it to be the same as exostosis. The carious part of a bone becomes so soft, that the end of a blunt probe may be easily forced into its substance. The openings, with which the bone is perforated, are filled with fungous flesh, which bleeds from the slightest cause. A dark-coloured serum is discharged, which always has a disagreeable smell, but becomes particularly fetid when exposed to the air.

In necrosis, the bone is entirely deprived of the vital principle; in caries, this principle exists, and there is a morbid action going on, which destroys the texture of the bone.

Some of the causes of caries are internal, others external. The former are the most frequent; a contusion, or external violence, being more apt to produce necrosis than caries.

Abscesses are said to produce, occasionally, a caries of the bones, over which they take place. For this reason, it has been laid down, as a rule, to open such abscesses at an early period, in order to prevent the disorder of the bone. If some abscesses, however, as for instance, those which form over the anterior surface of the tibia, and mastoid process of the temporal bone, be frequently attended with caries, the latter is the cause and not the consequence of the suppuration. Pus, which is a bland, unctuous, inodorous fluid, never attacks the soft parts, with which it is in contact, until its qualities are changed by exposure to the air. When an abscess forms in the anterior part of the parietes of the abdomen, the peritoneum of that part, naturally a thin membrane, instead of being corroded, becomes thick, and strong enough to resist the effusion of pus into the cavity of the abdomen. The periosteum becomes thickened in similar circumstances, when the abscess is a consequence of an external injury.

Serophula invades the spongy structure of the bones and the lymphatic system. A caries from this cause is very common in the tarsus, carpus, elbow, and knee; but it is always preceded by a white-swelling.

The venereal disease is sometimes a cause of caries, though its action on the

bones generally occasions necrosis, or exostosis. However, when it attacks the bones of the nose it renders them carious, by which they are consumed, and the face sadly disfigured. The bones of the palate are sometimes destroyed in the same manner, and by the same cause.

In cancers of the mamma, the sides of the sternum are sometimes found carious.

A superficial caries is easily detected. When the affected bone is deeply situated, the disease may be ascertained by introducing a probe, which will readily pass into the substance of the bone. But, bones not easy of access, may become carious, in which cases, the diagnosis is not so obvious. However, if a fistula, from which a fetid blackish matter flows, run forwards to a bone, and the adjacent soft parts be swollen, and indurated, there is reason to suspect the existence of caries.

Caries, occasioned by syphilis, affects most commonly the tibia, os frontis, ossa nasi, ossa palati, and sternum.

A caries of the vertebræ is known by peculiar symptoms, among which a paralysis of the inferior extremities, and lumbar abscesses, are the most remarkable.

A caries of the spongy parts of bones is much more difficult to cure, than a similar affection of their compact parts. Caries of the carpal and tarsal bones is particularly obstinate. These bones being in close contact, the affection cannot easily be prevented from spreading from one to the other. Amputation is often the only means of cure. The same is frequently the case, when the spongy heads of the long bones become carious. Even this mode of relief is not practicable when the head of the bone lies very deeply, like that of the os femoris.

Caries, resulting from scrophulous, or cancerous mischief, is more difficult of cure, than when it arises from venereal or scorbutic causes; for, some efficacious remedies against the latter are known; but cancer and scrophula resist all the remedies hitherto discovered. The prognosis is less favourable in old, than young subjects, and much depends on the extent of the disease, the patient's strength, and the state of the soft parts.

To form a just idea of the treatment of caries, we should consider, that a bone, thus affected, is a prey to a morbid action of its own parts, and that this action creeps from one part to another, and pervades the whole with greater or less rapidity, if art should not interfere, and assist nature in arresting its progress.

When the caries arises from constitutional disease, this should be resisted with suitable remedies.

Thus mercurial and sudorific medicines put a stop to caries arising from the venereal disease. Spirituous drinks, vegetable diet, and acids, cure both the scurvy, and the caries dependent on it.

But, when caries is altogether a local affection, the separation of the diseased parts may be promoted by absorbent powders, and stimulant applications. Lint, dipped in the tincture of aloes or myrrh, has often been put on such diseased bones. If these remedies be found ineffectual, a pledget of lint, dipped in a solution of the *argentum nitratum*, may be employed.

On the continent, and particularly in France, they still adhere to the plan of touching carious parts of bones with the actual cautery, after bringing them fairly into view by a previous use of the knife. It is thought, that the burning iron acts by changing the caries into a necrosis, irritating the subjacent sound parts, and exciting that action of the vessels, by which the dead or diseased part of the bones must be thrown off. (See *Boyer on Diseases of the Bones*, Vol. 1.)

Issues seem to be most effectual in checking the caries attendant on white-swings and diseased vertebræ. (See *Joints and Vertebræ*.)

Mr. Hey has succeeded in cutting away a carious part of the tibia. He began the operation by dissecting off the granulations of flesh, which had arisen from the bone, and then sawed out, by means of a circular headed saw, a wedge of the tibia, two inches in length. The removal of this portion brought into view a caries of the cancelli, almost as extensive as the piece already removed. With different trephines, suited to the breadth of the caries, Mr. Hey removed the diseased cancelli of the bone, quite through to the opposite lamella. As the caries extended in various directions, it was not possible to remove the whole of it with a trephine, without removing also a large portion of the sound part of the bone, which Mr. Hey wished to avoid. By the assistance, therefore, of a strong sharp-pointed knife, he pursued the caries in every direction, until every part was taken away, which had an unsound appearance. The wound was simply dressed with dry lint; the whole surface was speedily covered with good granulations, and a complete cure was obtained, without any exfoliation.

Mr. Hey concludes this subject, as follows: "I have treated some other cases of caries of the tibia in the same manner, and with equal success. Where the extent of the caries is not so great as to prevent a complete removal of the morbid

part, this method is extremely useful, and far superior to the use of the potential or actual cautery.

"The trephine is not wanted, where the cancelli of the bone are not affected with the caries. The diseased parts of the lamella may be removed with gouges or small chisels. Granulations of flesh will then arise from the sound parts of the bone, and become united with the integuments, which ought to be preserved as far as is possible."

The two cases, which Mr. Hey has related, are exactly of that kind, to which several writers apply the term *spina ventosa*. (See *Practical Observations in Surgery*.)

CARO ADNATA. An old appellation for the sarcocele.

CAROTID ARTERY, ANEURISM OF. (See *Aneurism*.)

CARTILAGES IN JOINTS. (See *Joints*.)

CARUNCLE. (dim. of *caro*, flesh.) *Caruncula*. A small excrescence, which has the appearance of flesh.

CASTRATION. *Castratio*. (from *castro*, to castrate.) The operation of removing a testicle. For an account of the cases rendering this necessary, see *Testicle, Diseases of*. The manner of operating is as follows: The patient being laid on a table of convenient height, the integuments covering the spermatic vessels in the groin, are to be divided. This incision should begin as nearly as can be, opposite to the opening in the abdominal muscle, and should be continued a good way down the scrotum.

The manner of beginning this incision is differently described by writers; some of them advising that the skin be held up by an assistant; others that the knife be used perpendicularly in this as in other parts. The latter mode is preferred by English surgeons in general. The length of the division is a more important consideration. A small wound will indeed serve to lay bare the spermatic chord; but it will not permit the operator to do what is necessary afterwards with dexterity, or facility; and as the scrotum must, first or last, be divided nearly to the bottom, it had better be done at first. The spermatic chord, thus laid bare, is to be freed from its surrounding membranous connexions; and then the operator, with his finger and thumb, separating the blood vessels from the vas deferens, must pass a ligature between them, and having tied the former only, must cut through the whole chord, at a quarter or half an inch distance from the said ligature, according as the state of the process and testicle will admit. This done; he is

then, with the same knife, with which he has performed the former part of the operation, to dissect the testicle out from its connexion with the serotum; the loose texture of the connecting cellular substance, the previous separation of the testicle from the spermatic chord, and the help of an assistant to hold up the lips of the wound, will enable him to do this with very little pain to the patient, and great facility to himself. If any considerable artery bleeds in the scrotum, it is to be tied. (*Pott*.)

Mr. S. Sharp once castrated a man, whose testicle weighed above three pounds, and some of the vessels were so exceedingly varicous and dilated, as nearly to equal the size of the humeral artery. (*Operations of Surgery*, chap. 10.)

Desault first divides the chord, and, holding its upper end between the index finger and thumb of his left hand, he then takes up the arteries with a pair of forceps, which are immediately tied by an assistant. (*Desault par Bichat*, Tom. 2.)

Pott used to fill the cavity of the wound with lint; but, Desault, and all the modern surgeons of this country, bring the edges of the wound together, and endeavour to heal as much of it as possible by the first intention. Some, with this view, use sutures and sticking-plaster; others, only the latter, aided with compresses and a T bandage; which means, in my humble opinion, are quite enough.

The operation of the compresses and bandages cannot be too carefully attended to, as it is the surest means of preventing hemorrhage from any small arteries in the scrotum, while it conduces to the union of the parts. Care must be taken, however, not to let the pressure hurt the sound testicle.

It is somewhat extraordinary, that M. Larrey should condemn the plan of uniting the wound, though, indeed, we cannot be surprised at his delivering this advice, when we recollect, that he disapproves of healing the stump, after amputation, by the first intention. The passage, relative to dressing the wound after castration, seems to be a contrast to the sensible observations which generally prevail in this author's publication: "*Il ne faut pas, réunir les bords de la plaie, comme l'ont conseillé quelques praticiens, parcequ'ils doivent suppurer, et que la suppuration est nécessaire!*" (*Mém. de Chirurgie, Militaire*, Tom. 3. p. 426.)

Sometimes, one or more vessels begin to bleed soon after the patient is in bed, although they effused no blood just after the removal of the testicle. Keeping the dressings and scrotum continually wet

with the cold saturnine lotion very often, suffices for the suppression of such hemorrhage: if not, the wound must be opened again, and the vessels tied.

M. J. L. Petit has made some useful remarks on this operation. The vessels of the scrotum, says he, are not the only ones, which may be the source of hemorrhage. Anatomists know, that the septum, which divides this part into two cavities, is furnished with an artery, that is not considerable, but, which becomes materially enlarged, in the case of a sarcocele, or other tumour. It is sometimes so considerable, that it causes a bleeding, which makes a surgeon, who has had no previous opportunity of seeing the occurrence, exceedingly uneasy. Such hemorrhage, adds M. Petit, may be easily suppressed with a ligature; and, he assures us, that he has seen a surgeon dress the patient three times, without ever suspecting, that the bleeding, for which the applications were a third time removed, proceeded from this artery. (*Petit Traité des Maladies Chirurgicales, Tom. 2, p. 524—525.*)

The same experienced and able surgeon also acquaints us, that he has more than once extricated from trouble persons, who knew not how to stop the bleeding after the operation. He has seen some of them take off the dressings several times, without discovering the wounded vessel. As they imagined, that the only hemorrhage, that could follow castration, must be from the spermatic artery, they contented themselves with examining the ligature on the cord, and increasing the compression, in order to stop the bleeding; but, finding their attempts fail, they were compelled to seek assistance. On being sent for, M. Petit found, that the blood did not issue from the cord, but from a small artery, under the skin, at the inferior angle of the wound. He easily stopped the hemorrhage, and explained, not only, that the cord had no share in the accident, but, that it is generally suspected without foundation. Indeed, says he, the least constriction will stop the bleeding from the spermatic artery; it is not essential to tie it;—"I myself am content with cutting the cord, so as to leave it rather longer than usual, and apply no ligature; I press it against the os pubis, near the ring of the external oblique; I lay over it a linen compress, half as thick as the finger, two inches in length, sufficiently broad to cover the part, and yet narrow enough to be placed entirely within the wound. Over this compress, I put dossils of lint; I fill the scrotum with plain lint, and then cover the whole with compresses,

observing to put one, which is thicker than the rest, above the pubes, immediately over that, which I have laid upon the cord, so that the bandage may make moderate pressure on this last part, yet sufficient to prevent bleeding." (*Op. cit. p. 526—527.*)

This quotation is not made with a view of inducing any modern operator to imitate the preceding practice, which, indeed, the advantages of the present mode of dressing the wound entirely forbid, as well as the greater security of the ligature; but, the passage is cited, for the express purpose of impressing on the mind of the young surgeon, that, in general there is more risk of bleeding from the vessels of the scrotum, than those of the cord, after the removal of a diseased testis. I have never seen hemorrhage from the spermatic artery give trouble after the operation, but have often known surgeons obliged to take off the dressings on account of bleeding in the scrotum.

In every operation, in which a considerable portion of skin is to be divided, and particularly in this, and in the amputation of women's breasts, it should always be remembered, that, as the division of the skin (the general organ of sensation) is the most acute and painful part of what is done by the knife, it cannot be done too quickly, and should always be done at once; the scrotum should always be divided to the bottom, and the circular incision in the skin of a breast always made quite round, before any thing else be thought of. If this be not executed properly, and perfectly, the operation will be attended with a great deal of pain which might be avoided, and the operator will be justly blameable. (*Pott.*)

When the diseased testicle is exceedingly large, or a part of the scrotum is diseased, the surgeon should take care to remove the redundant, or morbid portion of the skin, by including the piece, which he designs to take away, within two long elliptical incisions, which are to meet at the upper and lower part of the swelling. In this manner, as Mr. Samuel Sharp has observed, the hemorrhage will be much less, the operation greatly shortened, the sloughing of the distended skin prevented, and the recurrence of cancerous disease rendered less likely. (See *Treatise of the Operations, chap. 10.*)

If the tumour be of a pyriform figure, perfectly smooth, and equal in its surface, and free from pain, notwithstanding the degree of hardness may be great, and the surgeon may, in his own opinion, be clear that the tumour is not produced by water, but is a true scirrhus, let him, immediately previous to the operation,

pierce the anterior part with a trocar, in order to be certain. "My reason for giving this advice is, that I was once so deceived by every apparent circumstance of a true, equal, indolent scirrhus, that I removed a testicle, which proved upon examination to be so little diseased, that, had I pierced it with a trocar previous to the operation, I could and certainly should have preserved it. (Pott.)

It is well known, that the agony of tying the chord is immensely increased by including the vas deferens, and, as no good results from so doing, the practice deserves the severest reprobation, notwithstanding the opposite opinion of Pearson, and the writer of the article *Castration* in Rees' Cyclopædia.

Cases are even recorded, in which the inclusion of the whole of the spermatic cord appears to have occasioned severe and perilous consequences, and these in so great a degree, that it has been found necessary to cut and remove the ligature. Sometimes, says M. J. L. Petit, patients, on whom castration has been performed, suffer more or less acute pain in the kidneys. The suffering often becomes insupportable and highly dangerous, the belly being swelled, tense, and painful; the patient being affected with syncope, and affections of the heart, sometimes with vomiting, and a retention of urine, lastly, an universal inflammation of the belly, and a violent fever, accompanied with delirium, are occasionally the fatal consequences of this operation. Petit was required to visit a patient, who had been in this deplorable state for twenty-four hours, after having suffered castration, and this distinguished surgeon could impute the sudden and violent symptoms to nothing, except the ligature on the spermatic cord; consequently, he advised, the ligature to be removed. The patient received some slight relief from this step, and, after having been bled twice within a short space of time, he found himself a great deal better; but, as the dressings became wet with blood, apprehension of bleeding began to be entertained. Petit, therefore, had recourse to moderate compression of the cord, in the manner above related. No hemorrhage ensued; the case afterwards went on well; and the patient recovered sooner than was expected. (*Traité des Maladies Chirurgicales*, Tom. 2, p. 527, 528.)

In the operation of removing a testicle, one caution seems particularly necessary, viz. if the cord should be at all enlarged, the surgeon ought carefully to examine, whether the augmentation of its size may not be owing to a portion of intestine, or omentum, that is contained within it.

(See *Sabatier's Médecine Opératoire*, Tom. 1, p. 332, Edit. 1.) In one case of extirpation of the testicle, "after the operation was completed, and the wound dressed, the patient being seized with a fit of coughing, to the astonishment and dismay of the surgeon, the dressings were forced off by a protrusion of several convolutions of small intestines; from this, it was proved, that the patient had had a hernia; but, the diseased enlargement of the testicle had acted as a truss, and prevented the rupture from coming down." (See *Operative Surgery*, by C. Bell, Vol. 1, p. 226, also p. 224.)

There is another circumstance, which merits attention in the performance of this operation: when there are reasons, which oblige us to divide the cord high up, and this part has not been tied before such division is made, it may be drawn up by the cremaster within the abdominal ring, and some difficulty may be experienced in securing the spermatic arteries. Mr. B. Bell saw this happen twice, and the patients lost their lives from hemorrhage. Hence, when it is necessary to cut through the cord near the ring, the best plan is always to apply the ligature first, observing not to include the vas deferens. Were the cord, however, before being tied, to happen in any instance to be drawn up within the ring, a surgeon would be guilty of most supine neglect to let the patient die of bleeding; for, as Mr. C. Bell has remarked, we may follow the cord, with perfect safety, even to the origin of the cremaster, which pulls it up, if attention be paid to the course of the cord, obliquely upward and outward, within the inguinal canal.

It sometimes happens, that abscesses form in the remains of the spermatic cord, after the operation of castration. Such suppuration may frequently be prevented by the employment of bleeding directly after the operation, and repeating the evacuation on the first access of the inflammation of the part concerned. Besides venesection, low diet, neutral salts, diluents, &c. are indicated, and the part should be covered with an emollient poultice. When the pus is completely formed, the abscess should be opened.

When the symptoms subside, observes M. Petit, they, who are little versed in practice, are apt to fancy the abscess cured; but, they are sometimes mistaken. The matter is not always sufficiently near the surface to be felt, and, in this circumstance, the aponeurosis of the external oblique muscle is so tense, that it hinders the fluctuation from being distinctly felt. Indeed, as the matter finds a lodgment under this aponeurosis, fol-

lowing the course of the sheath of the vessels, there is reason to fear, that it may lead to additional inflammation and suppuration, and extend up the duplication of the peritoneum to the loins. In these cases, the abscess occasionally makes its way outward, and the dressings are inundated with matter; but, if this should not happen quickly, the sooner the tumour is opened the better. The opening ought unquestionably to be made wherever the fluctuation is plainly distinguishable; but, as Petit has remarked, the tension of the aponeurosis of the external oblique muscle makes the undulation of the matter less readily and plainly perceptible, than if the abscess were only in the fat. Therefore, in order to avoid mistake, this surgeon advises us to feel at the abdominal ring, as, in general, the pus can be more readily felt here, than in other situations. If matter is felt, and no resistance is experienced, Petit advises the finger to be passed into this opening, and, in case the seat of the abscess should be found to be under the aponeurosis, we are recommended to divide, with a probe pointed bistoury, the skin and fat immediately covering the ring, then to separate the fibres of this aperture, as it were, without cutting them. (See *Traité des Maladies Chirurgicales*, Tom. 2, p. 529—530.) No doubt, this surgeon meant, that the division of the tendon ought to be made in the direction of its fibres.

Consult *Le Dran's Operations*. Sharp's *Operations of Surgery*, chap. 10. *Pott on the Hydrocele*, &c. *Subatier, de la Méd. Opér.* Tom. 1. *Bertrandi Traité des Opér. de Chirurgie*, chap. 11. *Œuvres Chirurgicales de Desault* par Bichat, Tom. 2, p. 449. *Larrey Mémoires de Chirurgie Militaire*, Tom. 3, p. 423, &c. *Pearson on Cancerous Complaints*. *J. L. Petit, Traité des Maladies Chirurgicales*, Tom. 2, p. 519, &c. *C. Bell's Operative Surgery*, Vol. I. *Richerand's Nosographie Chirurgicale*, Tom. 4, p. 281, &c. *Édit. 2*, &c. *A long account of the particular sentiments of several eminent surgeons is to be found in Rees' Cyclopædia. art. Castration.*

CATAPLASM, (from *καταπλασσω*, to spread.) *Cataplasma*. A poultice.

The following ones are eminently useful.

CATAPLASMA ACETI. Made by mixing a sufficient quantity of vinegar with either oatmeal, linseed meal, or bread crumb. When linseed is employed, it is best to add a little oatmeal, or bread crumb, to keep the poultice from soon becoming hard. The vinegar poultice is generally applied cold, and is principally used in cases of bruises and sprains.

CATAPLASMA ACETOSÆ. *Sorrel Poultice*. & *Acetosæ* lbj. To be beaten in a mortar into a pulp.

CATAPLASMA ÆRATUM. *Fermenting Poultice*. & *Farinæ Tritici. Cerevisiæ Spumæ, Test dictæ; singulorum*, lbss. These are to be mixed together and exposed to a moderate heat, till the effervescence begins. This is a celebrated application in cases of sloughing and mortification.

CATAPLASMA ALUMINIS. Made by stirring the whites of two eggs with a bit of alum, till they are coagulated. It has been applied to the eye, between two bits of rag, in some cases of chronic and purulent ophthalmy, and is said to do good to chilblains, which are not broken.

CATAPLASMA BYNES. (Malt.) & *Farinæ Bynes, Spumæ Cerevisiæ*, q. s. This is applied to cases of gangrene and ill-conditioned extending sores. It is used in instances similar to those in which the cataplasma æratum is employed, and, by giving out carbonic acid gas, is supposed to operate as a gentle stimulus, and as a corrector of the fetid effluvia.

CATAPLASMA CARBONIS. Made by mixing powdered charcoal with linseed meal and warm water, and is applied to improve the condition of several kinds of unhealthy sores.

CATAPLASMA CEREVISIÆ. Made by stirring some oatmeal, or linseed meal, in strong beer grounds. It is used in the same cases, as the Cataplasma Æratum, and Cataplasma Bynes.

CATAPLASMA CICUTÆ. *Hemlock Poultice*. & *Herbæ cicutæ exfoliatæ* ʒij. *Aque fontanæ* lbij. To be boiled, till only a pint remains, when as much linseed meal as necessary is to be added.

This is an excellent application to many cancerous and scrophulous ulcers, and other malignant ones; frequently producing a great diminution of the pain of such diseases, and improving their appearance. Justamond preferred the fresh herb, bruised.

CATAPLASMA DAUCI. *Carrot Poultice*. & *Radicis Dauci recentis*, lbj. Bruise it in a mortar into a pulp. Some, perhaps, with reason recommend the carrots to be first boiled. The carrot poultice is employed, as an application to ulcerated cancers, scrophulous sores of an irritable kind, and various inveterate malignant ulcers.

CATAPLASMA DIGITALIS. Made by mixing linseed meal with a decoction of the leaves of the plant. It is said to have great sedative virtues, to be adapted to the same cases, as the cicuta poultice, and even to be more beneficial.

CATAPLASMA FARINACEUM. The bread and milk poultice, made by putting some slices of bread crumb in milk, and letting them gently simmer over the fire in a saucepan, till they are properly softened. The mass is then to be mixed and stirred about with a spoon, and spread on linen, in order to be applied. This poultice, which is of the emollient kind, is with many persons the common one for all ordinary purposes. Most surgeons, however, employ, instead of it, the linseed poultice, which is cheaper, more readily made, not apt to turn sour, and in all common cases, quite as advantageous in every respect.

CATAPLASMA LINI. *Linseed Poultice.* R *Farinæ Lini*, ℥ss. *Aq. ferventis* ℥ss. The powder is to be gradually sprinkled into the hot water, while they are quickly blended together with a spoon.

This is the best, and most convenient of all the emollient poultices for common cases, and has, in a great measure, superseded the bread and milk one, so much in use formerly.

Mr. Hunter speaks, in the following terms, of the linseed poultice, and its uses:

"Poultices are commonly made too thin; by which means, the least pressure, or their own gravity, removes them from the part; they should be thick enough to support a certain form when applied.

"They are generally made of stale bread, and milk. This composition, in general, makes too brittle an application; it breaks easily into different portions, from the least motion, and often leaves some part of the wound uncovered, which is frustrating the first intention.

"The poultice which makes the best application, and continues most nearly the same between each dressing, is that formed of the meal of linseed: it is made at once, and when applied, it keeps always in one mass."

"The kind of wound, to which the above application is best adapted, is a wound made in a sound part, which we intend shall heal by granulation. The same application is equally proper when parts are deprived of life, and consequently will slough. It is therefore the very best dressing for a gunshot wound, and probably for most lacerated wounds; for lint, applied to a part that is to throw off a slough, will often be retained till that slough is separated, which will be for eight, ten, or more days."

CATAPLASMA LYTHARGYRI ACETATI.

R *Aquæ lythargyri acetati* drach. j.

Aquæ distillantæ lb. j.

Micæ panis q. s.—*Misce.*

Practitioners, who place much confidence in the virtues of lead, externally applied, often use this poultice in cases of inflammation.

CATAPLASMA MALI MATURI.—This is made by roasting a ripe apple, removing the peel and core, and beating the pulp into a soft mass. It is sometimes applied to inflamed eyes, by means of a little muslin bag.

CATAPLASMA MURIATIS SO.
DÆ. R *Pulveris Lini*, *Micæ Panis* ā ā *partes æquales*, *Aq. Sodæ Muriatæ* q. s. This is used for diminishing scrofulous tumours and glands. When it excites too much irritation in the skin, a linseed poultice may be put on for a little while.

CATAPLASMA QUERCUS MARI.
NI.

This is prepared by bruising a quantity of the marine plant, commonly called *sea tang*, which is afterwards to be applied by way of a poultice.

Its chief use is in cases of scrophula; white swellings and glandular tumours more especially.

When this vegetable cannot be obtained in its recent state, a common poultice of sea-water and oatmeal has been substituted by the late Mr. Hunter and other surgeons of eminence.

CATARACT. (from *καταρσσω* to confound, or disturb; because the disease confounds, or destroys vision.) This is a species of blindness, arising almost always from an opacity of the crystalline lens, or its capsule: the cataract depending on an opaque state of the liquor of Morgagni being very rare.

Hippocrates called it, *γλαυχωμα*. Galen, *υποχυμα*. The Arabians, *gutta opaca*, Celsus, *suffusio*.

Hippocrates, and the ancient Greeks described the cataract, as a disease of the crystalline lens under the name above mentioned; but, no sooner had Galen promulgated the doctrine of the lens being the immediate organs of sight, than the correct opinion of the ancient founder of medicine began to decline, and, for many ages afterwards, had no influence in practice. In fact, the seat of the cataract seems to have been entirely forgotten, till about 1656, when first Lasnier, and, afterwards, Borel, Bonnetus, Blegny, Geoffroi, &c. revived the truth, which appears to have been so long extinct, and they, and a few others, believed that the disease was situated in the crystalline lens. The bulk of practitioners, however, remained ignorant of this fact even as late as 1713, or, in other words, until the several publications of

Mery, Maître-Jan, Brisseau, and Heister, combined to render the truth universally known. (*Critical Reflections on the Cataract.*)

SYMPTOMS OF A CATARACT.

The cataract shews itself, as a speck, or spot in the pupil of the eye, occupying sometimes the whole, and sometimes only a part of this aperture. It is most commonly of a grey, or whitish colour; but, sometimes, of a deep white, and, it may, in all cases, be easily distinguished from the naturally dark appearance of the pupil. In the commencement of the disorder, it occasions a weakness, or imperfection of the sight; and it terminates, sooner or later, in the almost total extinction of this sense. During its progress the persons, who are affected by it, perceive objects more distinctly in a moderate, than a strong light; the reason of which is, that the pupil being more dilated in a weak light still admits some rays, through the yet transparent circumference of the crystalline. (*Wen- sel on the Cataract.*)

A settled mist seems to cover objects, and confuse those, which are minute. In this disorder, especially, when it arises without any assignable external cause, this mist is almost always perceptible by the patient, before any opacity has become visible in the pupil. (*Ware.*)

DIFFERENT KINDS OF CATARACT, AND PARTICULAR SYMPTOMS OF EACH.

When the opaque lens is either more indurated, than in the natural state, or retains a tolerable degree of firmness, the case is termed, a *firm*, or *hard cataract*. When the substance of the lens seems to be converted into a whitish, or other kind of fluid, lodged in the capsule, the case is denominated a *milky*, or *fluid cataract*. When the opaque lens is of a middling consistence, neither hard, nor fluid, but, about as consistent, as a thick jelly, or curds, the case is named a *soft* or *caseous cataract*. When the anterior, or posterior, layer of the crystalline capsule becomes opaque, after the lens itself has been removed, from this little membranous sac, by a previous operation, the affection is named a *secondary membranous cataract*.

There are no certain criteria, by which it can be ascertained previously to an operation, whether a cataract is soft or hard; of a caseous or fluid consistence; or whether, together with an opacity of the crystalline lens, the membranous capsule, in which it is contained, may not

have lost its natural transparency; those formerly mentioned by Richter, and other similar ones proposed for consideration by Mr. Pott, cannot be sufficiently confided in, to form a guide in practice.

I think it right, however, to state, in as concise a manner as possible, the symptoms and appearances, which Richter has more recently explained, and, for a long series of years, found generally to portend the truth; and I shall confine myself to the hard, the fluid, and the caseous or soft cataracts.

The harder the cataract is, the thinner and smaller it becomes. In this case, the disease presents either an ash-coloured, a yellow, or a brownish appearance. The interspace, betwixt the cataract and pupil, is very considerable. The patient very distinctly discerns light from darkness, and can even plainly perceive large bright objects. In the dilated state of the pupil, a black circle surrounding the lens is very perceptible. The motions of the pupil are free and prompt. The anterior surface of the cataract appears flat without any degree of convexity. (*Richter's Anfangsgrunde der Wundarzneykunst, p. 177. 3 Band.*)

The fluid, or milky cataract, has usually a white appearance; and irregular spots and streaks, different in colour from the rest of the cataract, are often observable on it. These are apt to change their figure and situation, when frequent and sudden motions of the eyes occur, or when the eyes are rubbed and pressed; sometimes, also, these spots and streaks vanish, and then re-appear. The lower portion of the pupil seems more opaque than the upper, probably, because the untransparent and heavy parts of the milky fluid, sink downward to the bottom of the capsule. The crystalline lens, as it loses its firmness, commonly acquires an augmented size. Hence, the fluid cataract is thick, and the opacity close behind the pupil. Sometimes one can perceive no space between the cataract and margin of the pupil. In advanced cases, this aperture is usually very much dilated, and the iris moves very slowly and inertly. This happens because the cataract touches the iris, and impedes its action. The fluid cataract is sometimes of such a thickness, that it protrudes into the pupil, and presses the iris so much forward, as to make it assume a convex appearance. Patients, who have milky cataracts, generally distinguish light from darkness very indistinctly, and sometimes not at all; partly, because the cataract, when it is thick, lies so close to the iris, that few or no rays of light can enter between them into the eye; partly, because the fluid

cataract always assumes, more or less, a globular form, and therefore has no thin edge, through which the rays of light can penetrate. (*Richter's Anfangsgründe der Wundarzneykunst.* 3 Band. 174, 175.)

Sometimes the opaque lens is of a middling consistence, neither hard, nor fluid, but about as consistent as thick jelly, curds, or new cheese. Cases of this description are termed soft or caseous cataracts. As the lens softens in this manner, it commonly grows thicker and larger, even acquiring a much greater size than the fluid. It is not unfrequent to meet with caseous cataracts of twice the ordinary size of a healthy crystalline lens. It impedes the motion of the pupil more considerably than the fluid cataract, because it lies closer to the iris. It is accompanied with all the symptoms of fluid cataracts, except that the spots and streaks, sometimes also observable on this kind of cataract, do not vary their situation and figure. (*Richter's Anfangsgründe der Wundarzneykunst.* p. 178. 3 Band.)

CAUSES OF THE CATARACT.

Persons, who are much exposed to strong fires, as blacksmiths, locksmiths, glassmen, and those, who are engaged in similar employments, seem to be more subject to the cataract, than others. Persons, above the age of forty, are reckoned more liable to cataracts, than younger ones. (*Wenzel.*) The disease, however, is, by no means, unfrequent in the latter; even children are often seen affected with this kind of blindness, and some are born with it. In the majority of instances, a cataract seems to arise spontaneously, without any assignable cause. Sometimes the opacity of the lens is the consequence of external violence: a case, which, more frequently, than any other, gets well without an operation.

PROGNOSIS, AND MODE OF JUDGING OF CASES FIT FOR AN OPERATION.

Some little attention is necessary to distinguish those cases of cataract, which afford a reasonable prospect of benefit from an operation, and to discriminate them from others, either less promising, or absolutely prohibitory of relief.

When, in the incipient state of the disease, the patient discerned objects, as it were, through a mist, which increasing in density, at length became a complete impediment to vision; when the opacity of the crystalline lens has supervened gradually, and has not been preceded, and is not accompanied by a chronic ophthalm-

my peculiarly affecting the interior of the eye; when no particular head-ach, nor pains in the eye and eye-brow have been experienced; when the pupil, notwithstanding the cataract, preserves its circular figure, and the faculty of varying its dimensions in the different degrees of light; when the patient can distinguish a brilliant light from total darkness; and, especially, if in a moderate light, where, usually, the pupil is not too much contracted, he should be able to distinguish bright colours, and the shadows of objects before him: there is every reason for performing, and expecting success from, an operation. (*Scarpa sulle Malattie degli Occhi.*)

The power of distinguishing light from darkness, is much more satisfactory, than motion of the iris. I have seen in St. Bartholomew's Hospital, and in the York Hospital under Mr. Albert, several cases of complete gutta serena in both eyes, in which there was the freest contraction and dilatation of the pupils. It is obvious, that, had such patients been, at the same time, afflicted with cataract (a complication by no means unfrequent,) and a surgeon, induced by the moveable state of the iris, had undertaken an operation, how unavailing it must have proved, since the rays of light could only have been transmitted to an insensible retina. Richter, and Wenzel, make mention of these peculiarities, and the latter refers the phenomenon to the iris deriving its nerves wholly from the lenticular ganglion, while the immediate organ of sight, is constituted entirely by another distinct nerve. Hence we can no longer consider motion of the iris as an infallible criterion, according to several authors, (*Wathen*) that the retina is endued with sensibility. Relating to this subject, is a curious remark by Mr. Lucas in the Medical Observations and Inquiries: he attended, in conjunction with Messrs. Hey and Jones, his colleagues of the Leeds Infirmary, five children of a clergyman at Leaven, near Beverly, who were all born blind. He writes, "None of them can distinguish light from darkness, and, although the pupil is, in common, neither too much dilated nor contracted, and has motions, yet these do not seem to depend upon the usual causes, but are irregular."—(*Vol. 6.*)

The reciprocal sympathy between the two organs of sight, is so active, that no one, solicitous to acquire either physiological, or pathological knowledge respecting them, ought, for a moment, to forget it. Hence, in the examination of cataracts, it is of the highest importance to keep one eye entirely secluded from the

light, while the surgeon is investigating the state of the iris in the other; for, the very impression of the rays of light upon one eye, sensible to this stimulus, is known to be often sufficient to produce corresponding motions of the iris in the opposite one, although in the state of perfect amaurosis. In other examples of cataract, the pupil may be quite motionless, and yet sight shall be restored after the performance of an operation. (*Wenzel*.) There are, however, two circumstances, which may prevent us from ascertaining, whether the retina is sensible to light or not: the first is, a circular adhesion of the crystalline capsule to the iris. It must be a difficult thing to discriminate the nature of this case, by merely observing, as *Richter* directs, the distance between the cataract and pupil: inferring, that when the space, between the pupil and opaque lens, is inconsiderable, such an adhesion has happened; and, that when the cataract does not seem particularly close to the pupil, and yet the patient cannot discern light from darkness, it is complicated with amaurosis. The second circumstance sometimes utterly preventing the ingress of any light to the healthy retina, is the round bulky form of the cataract.

But although I have remarked, that the power of distinguishing light from darkness is more satisfactory, than motion of the iris; it is not an unequivocal test of the retina being perfectly free from disease. While the gutta serena is incomplete, the patient can yet distinguish light, and the shadows of objects. Dilatation of the pupil is, also, a deceitful criterion to ascertain the complication of gutta serena with the cataract. When the cataract is large, or adherent to the iris, the pupil is frequently much dilated, however natural and sound the state of the optic nerve may be: the pupil often continues quite undilated in the most perfect gutta serena. (*Richter*)

From all this it must be manifest, 1st, that the irregularity, and inconstancy of the symptoms of gutta serena, together with the possibility of particular states of the cataract rendering the patient utterly unconscious of the stimulus of light, make it necessary for the surgeon to be particularly attentive to the appearance, and to the history of the origin and progress of the disease, in order to understand the real condition of certain cases. 2d, That, when the patient can distinguish light from darkness, though the iris may be motionless, there is good ground for trying an operation. Possibly, in this circumstance, an incipient amaurosis may exist, but, the chance of

the defect of the iris arising from other causes; the *certainty*, that the opaque body *must* be removed from the axis of sight, (even were the disease of the retina cured,) ere sight could be restored; and the *improbability*, that an operation to cure the cataract, would render the other complaint at all less remediable: fully justify the attempt. 3dly, That, should the patient have been free from particular pain in the head and eye; should he, in a previous stage of the cataract, have been able to distinguish light from darkness, and then suddenly have lost that power, in consequence of inflammation affecting the eye, and depriving the iris of motion; in which case there is ample reason to conclude, that adhesions between the iris and cataract have taken place; and should there be ground to suspect, from the appearances which I have already noticed, that the cataract is of exceedingly large dimensions; notwithstanding the incapacity to feel the stimulus of light, there is yet sufficient foundation to entertain a little hope, and to vindicate the practice of the only effort that can be availing, and, excepting a trivial and a temporary pain, one that cannot be materially injurious to the patient. The concurrent testimony of almost all writers upon the subject confirms, that the restoration of sight has sometimes been effected in the most hopeless cases, and I am, therefore, of opinion with *Mr. Lucas*, that it is proper, in all doubtful cases, to try couching, as a remedy by no means violent, or hazardous. (*Med. Observations and Enquiries, Vol. 6, p. 257.*)

As it not unfrequently happens, that cataracts, produced by external violence, spontaneously disappear, (*Pott, Hey, &c.*) the operation should never be too hastily recommended for such instances. One reason, assigned for not operating, when only one eye is affected, viz. that one eye is sufficient for the necessities of life, is but of a frivolous description; and, another, that the patient would never be able to see distinctly after the operation, by reason of the difference of the focus in the eyes, is (I have grounds for believing) only a gratuitous supposition, blindly transmitted from one writer to another. In support of what I have here advanced, and to prove, that success does sometimes, probably in general (if no other causes of failure exist,) attend the practice of couching and extraction, when only one eye is affected with a cataract, I shall first adduce a fact from *Maitre Jan*. (*Traité des Maladies de l'Oeil Edit. Paris, 1741, 12mo. Obs. sur une Cataract elaitense, p. 196.*)

“Le 17 Octobre de l'année 1685.

J'allai à Savière pour abaisser une Cataracte dans l'œil gauche d'un jeune garçon appelé Nicolas Very valet de Sébastien Coutan, laboureur. Cette cataracte me paroissoit d'une bonne couleur, la pupille se dilatoit lentement, et beaucoup, et se resserroit de même, quand je passois la main entre l'œil et le grand jour, *le sain étant fermé,*" &c. After describing the operation, he continues: "Quelques jours après j'é retournai le voir, et je trouvai que l'humeur aqueuse étoit fort éclaircie et qu'il *distinguoit toutes sortes d'objets*: je le vis encore sept ou huit jours après en passant par son village, et je le rencontrai faisant son ouvrage, et entièrement guéri, sans qu'il parût qu'il eût jamais été incommodé de cataracte.

Baron Wenzel was in the habit of extracting cataracts with the most successful result, when only one eye was affected with the disease, as may be learnt by referring to the cases here specified. (*Cases 6, 13, 16, 19, 22, 25, 29, 30, 31, 34, &c. Treatise on the Cataract*) It will only be necessary to quote here two cases, related by this eminent oculist. "Madame Harvey, a tobacconist, at Chalons sur Marne, presented a complicated case similar to the preceding. She had a cataract in the right eye, combined with an opacity in the anterior portion of the capsule as appeared by the white spots and inequalities, of which I have spoken above, in the surface of the crystalline. *Her left eye was sound.* I operated on the right eye in the year 1782, &c. The patient suffered some pain in consequence of the operation, but it was soon removed by bleeding her in the foot; and, notwithstanding this obstacle, the sight was soon recovered to as great a degree of perfection as was possible after such an operation." (*Wenzel on the Cataract, p. 138, Case 16.*)

The following case is as explicit as possible on the point under consideration. "A poor woman, de la Ferté sous Jouarre, who had a cataract in the right eye upwards of ten years, came to consult me in the year 1780. I found all the symptoms of the case favourable to an operation," &c. (after describing the manner of doing it, he continues:) "I immediately bound up, not only the eye that had undergone the operation, but the *sound one* also; a precaution, which it is necessary to use after all operations on the eye, even the most simple; it being almost impossible, that one eye should not follow the motions of the other, &c. In a fortnight she was perfectly cured; and, though the pupil remained larger than it was before the operation, or than that in the left eye, and had much less motion,

yet this eye, as well as the other, perceived objects very distinctly." (*Case 22, p. 166. In the Medical and Physical Journal for May 1808, there is a paper in support of the foregoing observations.*)

I next proceed to notice what Richter has remarked upon this head. He was formerly convinced, that the advice not to operate, when only one eye is affected with a cataract, ought, for several reasons, to be disregarded; he reminds us of the wonderful consent between the eyes, so that one is seldom diseased without the other, sooner or later, falling into the same state; and hence he questions, whether it may not be possible to prevent the loss of the sound eye by a timely operation? An non caveri possit jactura integri oculi tempestive extrahendo cataractam prioris? (*Obs. Chir. Fascic. 1.*) He adverts to the remarkable case related by St. Ives, where a man was wounded in the right eye by a small shot, and, shortly afterwards, had a cataract in it; he then gradually became blind in the left, but soon recovered his sight in it, after the cataract had been extracted from the right one. Here let us notice, that St. Ives (*Maladies des Yeux, Chap. 15, Art. 3.*) makes no mention of any confusion in vision, in consequence of the different refracting powers of the two eyes in question. Another reason judiciously assigned by Richter, (*Obs. Chirurg. Fascic. 1.*) for disregarding the above precept, is, that in waiting until a cataract forms in the other eye, the existing one, which is at this moment, perhaps, in the most favourable state for the operation, may soon change so much for the worse (for instance it may contract such adhesions to the iris,) as either to destroy all prospect of relief, or, at most, afford but a very precarious and discouraging one. The length of time necessary to wait is also very uncertain and tedious. I once saw a man in St. Bartholomew's Hospital, who had had a cataract in one eye fifteen years, during all which time the other continued quite sound. I am surprised that Richter should latterly have inculcated a contrary opinion, and, not given the particular facts, that have induced him to revoke, as it were, his former sentiments. The principal reason stated by him is, that the patient, not only does not see much more acutely with the two eyes after the operation, than with one before it, but, he frequently sees more confusedly; because the eye, that has been operated on, cannot see well without the aid of a glass, which, perhaps, the sound one does not require. "Er sieht nicht allein nach der Operation mit zwey Augen nicht viel schärfer, als vor der operation mit einem Auge, sondern er sieht

auch oft undeutlicher, da das operirte Auge nicht ohne Brille, das gesunde aber vielleicht ohne Brille scharf sieht." (*Lehrungsgründe der Wundarzn. Dritter Band* p. 199.)

When I remember, that no cases are adduced by this author to contradict the rationality of his former sentiments; when I also reflect upon the facts recorded by Maître-Jan, St Ives, and Wenzel; when I contemplate, that Callisen mentions, as the feeble ground of his adopting the common opinion, that, in one single instance of this description, he was unsuccessful, without particularizing from what immediate cause the failure arose; there appears to my mind strong cause to believe, that the advice, not to operate, when there is only one cataract, and the other eye is perfect, rests upon the false basis of prejudice and plagiarism. Warner's objection is similar to that specified by Richter: he writes, "the eye, from which the crystalline lens is removed, cannot be restored to a degree of perfection at all equal to that of the sound eye, without the assistance of a convex glass:" (*Description of the Human Eye and its Diseases*, p. 85) but, is not the power of using both eyes at the same time, even with the inconvenience of being necessitated to employ a glass for the purpose, preferable to being blind of one? The cases, which I have quoted, at least prove, that confusion in vision, is not always the result of the practice, which I contend for: whether the fact is concordant with the modern theory of vision, is entirely another consideration; if it should be found inconsistent with it, we must infer, that our knowledge of optics still continues imperfect; not, that such well-attested examples, as some alluded to, are unworthy of belief.

When there are cataracts in both eyes, most authors are of opinion, that there is no reason, why one should not be couched immediately after the other; and, it must be confessed, that, in general, the simplicity and mildness of the operation, will admit of this method without the least evil resulting from it. But it must also be confessed, that the ophthalmia after couching sometimes attains a greater height than is agreeable, either to the feelings of the patient, or the wishes of the surgeon. The excitement of violent inflammation, is what we ought to endeavour to avoid in performing all operations. Will it not inevitably happen, by reason of the mutual sympathy between the two organs of sight, that the ophthalmia after couching will, *ceteris paribus*, be more severe when it is done at the same time on both, than when performed on each at

separate periods? Inflammation in one eye almost constantly kindles the same process in the other. Scarpa's experience establishes the truth of these reflections, and, what reason might anticipate, an appeal to practice confirms. "Ne' malati di cateratta in ambedue gli occhi, la speranza mi ha insegnato che non è pinto vantaggioso l'operarli immediatamente uno dopo l'altro; ma che giova aspettare la guarigione d'uno prima d'intraprendere l'operazione dell'altro." (*Saggio di Osservazioni*, &c. p. 255.)

The majority of surgeons imbibe an opinion, that no operation should be undertaken for the cataract, before the patient has attained the age of docility and reason, and, in a point of view, abstractedly surgical, there can be no doubt of the rectitude of such advice; but, when it is further considered, how essential sight is to the acquirement of education; that youth is the condition best adapted for this indispensable pursuit; that couching is a very easy operation; that, to perform it conveniently, nothing more is required, than to have the child's head steadily fixed; that, with the aid of an assistant, this object can more effectually be accomplished; that, in delaying the operation, the cataract may acquire adhesions; that persons have, not only had cataracts successfully depressed at a very early age, but, have, with the assistance of a *speculum oculi*, even had them extracted, (see *Mr. Ware's note*, p. 90, of *Wenzel's Treatise*) which is universally acknowledged to be a far more difficult process; and that the pupil of the eye, in a young subject, is nearly as large as in an adult; (*Warner's Description of the Human Eye and its Diseases*, p. 34) I cannot help thinking with Mr. Lucas, that, after a child is old enough to bear an operation, couching may be proper at any age. This gentleman (we may infer from his observations) was in the habit of couching children; for he states, that the reason for his not operating on the five children born blind (mentioned above,) was the insensible state of the retina: not their youth.

Here couching seems to be more applicable than extraction; for, although it is very practicable to fix a child's head very securely, it is not so to prevent (without the use of a speculum, by which extraction is rendered doubly dangerous) that rolling motion of the eyes from taking place, peculiar, almost without exception, to children, and which would, undoubtedly, make it too arduous to cut the cornea with the due precision, necessary for the success of the more modern operation. Surgeons do not refuse to operate for the hare lip, as early as two years of age; they do

not wait for docility and reason in the patient, to make him manageable, and sensible of the propriety of submitting quickly to the performance of the operation; they render him tractable by force, and thus they wisely succeed in making, perhaps, with more certainty, than reliance upon the fortitude of any human being would afford, a very precise incision, such as the nature of the operation demands; and, why should they refuse to couch children, when the motives are more urgent, and it is equally in the power of art to substitute means, quite as effectual as docility and reason in surgical patients? What experienced operator would trust to these qualities, when he undertakes any grand operation, even on the most rational and firm adult? (*Critical Reflections on the Cataract*, 1805.)

During the last four or five years, the attention of surgeons has been much drawn to the subject of operating on the cataracts of children, and the propriety of the practice seems to be now firmly fixed on the basis of experience. It is even ascertained, that the couching needle may be successfully employed on children of the most tender age. The late Mr. Saunders, surgeon to the London Infirmary for curing diseases of the eye, may be said to have had the principal share in promoting the adoption of this important improvement. His practice confirmed, what reason had long ago made probable, and the judgment, tenderness, and skill, with which he operated, on the eyes of infants, as well as those of adults, were followed by a degree of success, which had never been previously witnessed, and which infused quite a new spirit into this most interesting branch of surgery. Subjects, from eighteen months to four years old, received most benefit from Mr. Saunders's operations; and, if any intermediate time be selected, Dr. Farre (the editor of this gentleman's publication) is inclined to recommend the age of two years. "The parts have then attained a degree of resistance, which enables the surgeon to operate with greater precision, than at an earlier period; yet, the capsule has not become so tough and flexible, as it does at a later period, after the lens has been more completely absorbed.

"But, this is not the greatest, although a considerable advantage of an early operation, for, in cases, in which the patient has no perception of external objects, the muscles acquire such an inveterate habit of rolling the eye, that, for a very long time after the pupil has been cleared by an operation, no voluntary effort can control this irregular motion, nor direct the eye to objects with sufficient precision for

the purpose of distinct and useful vision. The retina too by a law, common to all the structures of an animal body, for want of being exercised, fades in power. Its sensibility, in many of the cases, cured at the age of four years and under, could not be surpassed in children, who had enjoyed vision from birth: but, at eight years, or even earlier, the sense was evidently less active; at twelve, it was still more dull; and from the age of fifteen and upwards, it was generally very imperfect, and sometimes the mere perception of light remained. But, these observations do not apply to those congenital cataracts, in which only the centre of the lens and capsule is opaque, the circumference being transparent, for, in those, the retina is exercised by a perception, although an imperfect one, of external objects, the motions of the muscles, which direct the globe, are associated, and an absorption of the lens does not take place: therefore, in this variety of the disease, the argument in favour of an early operation, is not so much a medical, as a moral one—it is preferable for the purposes of education and enjoyment." (*Saunders on Diseases of the Eye*, p. 153—155.)

Besides Mr. Saunders, several other surgeons of the present day have become zealous advocates for operating upon the cataracts of children. Even Mr. Ware, one of the ablest partisans of extraction, now strongly recommends the use of the needle in the congenital cataract of infants and children. His mode of operating, I shall hereafter notice. Mr. Gibson, of Manchester, has likewise urged the propriety of couching young subjects, and fixes on the age of six months, as preferable to that of two years. "Whatever objections (says he) have been urged against the safe and effectual use of the couching needle in infants, have always appeared to me so slight, and so easily surmountable, that, without inquiring particularly into the real state of the question, I have long concluded in my own mind, that the same motives, which would induce an operator to couch a cataract at any period of adult life, would equally lead him to perform that operation at any earlier period, when a cataract might exist. Acting upon this presumption, I have operated upon children of all ages, for ten years past" (*See Edinb. Med. and Surgical Journal*, Vol. 7, p. 394.)

Mr. Gibson's paper being dated June, 1811, we are of course given to understand, that he has pursued this practice from the year 1801, and he asserts that his experience has embraced a considerable number of cases.

"In performing the operation of couch-

ing infants, it has always appeared to me, (says this gentleman,) that the advantages to be gained by restoring vision at so early a period, are so important, as to bear down any obstacles which may occasionally be opposed to the safe use of the needle. Even the risk of deranging the figure of the pupil forms no solid objection to its use; and may always be avoided by steadiness and good management. Should even a slight change in its figure be produced, it is seldom in the least detrimental to distinct vision, and can scarcely be considered a blemish in the eye of any one; except, perhaps, in that of a geometriician; who may not easily reconcile to himself the presence of an oval opening, where one of a circular form should exist. It may farther be observed, that, if an operator cannot depend upon his management of the eye, so as to render it steady by the introduction of the couching needle, he can avail himself of the assistance of a speculum to restrain its motions.

"The following observations will apply principally to infants under twenty months old. The advantages, which an operator possesses, in operating upon a child of this age, as compared with a child of three years old, or upwards, are important. An infant is not conscious of the operation intended: it is free from the fears created by imagination, and can oppose very feeble resistance to the means employed to secure it with steadiness. At an early age, it has not acquired the power of retracting the eye deep in the socket, so that the operator has always a good prospect of introducing the couching needle with ease, by watching a proper opportunity. The eye has not, at this time, acquired the unsteady rolling motion, which, after a few years, is so common and remarkable in children born blind, or reduced to that state soon after birth. So that this impediment to the easy introduction of the needle does not exist in infants a few months old. The operator also has it in his power to administer a dose of opium, sufficient to render the steps necessary to expose the eye, almost entirely disregarded by his patient. With respect to the state of the eye itself, but, particularly, that of the cataract, this is more favourable for the operation, than at any future period of life. *In infants, the cataract is generally fluid*, and merely requires the free rupture of its containing capsule, which is in that case generally opaque. The capsule, however, is tender, and easily removed by the needle, so as to leave an aperture sufficiently large for the admission of light. The milky fluid, which escapes

from the capsule, is soon removed by absorption. If, on the other hand, (says Mr. Gibson) the cataract should be soft, it is generally of so pulpy a softness, that the free laceration of the anterior part of its capsule, and the consequent admission of the aqueous humour, ensures its speedy dissolution, and disappearance, without the necessity of a second operation. Should the cataract happen to be hard, there will be no more difficulty in depressing it, than in an adult. So uniformly favourable is the state of the cataract to the success of the operation, that I may venture to pronounce, that an operator of common experience and expertness, will seldom fail of success, if he can, in an adult, depress a hard cataract, or rupture the containing capsule, and break down the substance of a soft, or fluid cataract when it occurs.

"Such (continues Mr. Gibson) are the advantages, derived from the age of the patient, and state of the eye, which would induce an operator to use the couching needle a few months after birth. If, however, a surgeon had even difficulties to encounter, which do not occur in adults, surely the invaluable benefit, conferred by enabling an infant to become an intelligent being, like other children, instead of remaining in a state approaching to idiotism, would incline him to run some risk of failure, and to make more than common exertion, especially as there is little chance of injuring the eye, when proper cautions are used. Yet, so important a consideration appears to have had little influence upon oculists, and hence, many children have been doomed to years of darkness, happy in the estimation of their parents and friends, if they could distinguish black from white; or discern any perceptible difference between the brightness of the sun, and the glimmering of a tallow candle.

"These advantages, which an operator will possess, when he attempts the removal of a cataract in a child of a few months old, are peculiar to that period. In proportion as the age of the patient advances, until he arrives at the age of discretion, and can estimate, in some measure, the value of sight, by feeling his loss, the difficulties, opposed to the use of the couching needle, increase. His fears of the operation, the unsteadiness of the eye, and his power of retracting it within the orbit, present considerable, but not insuperable obstacles: such, however, as every surgeon would willingly dispense with, if he had it in his power.

"Before an operation, at an early age is recommended, the practitioner ought (as at any other age) to ascertain, that the cataract is not complicated with a defect-

tive state of the retina, or with a complete amaurosis. Such cases are by no means uncommon. Some years ago, I recollect to have seen five or six children, the families of two sisters, who were all totally blind, and in an idiotic state, with cataracts accompanied by amaurosis." (*Gibson Op et loco cit*)

I find in this gentleman's paper, also, some arguments, which have been repeated in Mr. Saunders's work. "Few practitioners, at all conversant with cases of blindness from birth, will deny, that it is highly probable, that the eye may lose a considerable part of its original powers, from the mere circumstances of its having so long remained a passive organ. Hence, probably it happens, that, in some cases of congenital cataract, the only benefit conferred on the patient, by an operation, is that of enabling him to find his way in an awkward manner, and to discriminate the more vivid colours. Such patients have never been able to discern small objects, or to judge, in any useful degree, of figure, or magnitude; I am well aware, however, says Mr. Gibson, that, in some rare instances, such a defective state of the eye exists from birth.

"Another circumstance, which, must have attracted the attention of oculists, is, that, in a few years, the eye of a patient born blind, acquires a restless and rolling motion, which is at length so firmly established by habit, that he has little controul over it. This motion unfortunately continues, for a considerable time, after sight has been restored to such a person, and is a very material obstacle to the early attainment of a knowledge of the objects of vision. He cannot fix his eye steadily upon one point for a moment, and the inconvenience, which arises from this unsteadiness, is, to such a person, occasionally as great a bar to the distinct view of an object, as the unsteady motion of the same object would be to one, whose vision is perfect. This inconvenience any one can appreciate, and, as far as I know, it is completely avoided by restoring sight at an early age."

As a motive for operating on infants, Mr. Gibson also comments on the loss of those years, which ought to be spent in education (*See Edinb. Med and Surgical Journal, Vol. 7, p. 394—400.*)

TREATMENT OF THE CATARACT.

The principal external remedies, that have been employed in the cure of the cataract, are, bleeding, cupping, scarifying, setons, issues, blisters, and fumigations; and the principal internal remedies are, aperients, incisives, emetics, ca-

thartics, sudorifics, cephalics, and sternutatories. Preparations of eye-bright, millepedes, wild poppy, henbane, and hemlock, have also been much commended, as specifics for the disorder.

Scultetus asserts, that he checked the progress of a cataract, by applying to the eye the gall of a pike, mixed with sugar; and Spigelius, as we are informed by the same author, boasted of having successfully used, for this purpose, the oil of the cel-pout (*mustela furviatilis*)

Cataracts are said to have been cured in venereal patients, while under a course of mercury. It is probable, however, that many such cases have been mere opacities of the cornea, which have been mistaken for cataracts. Baron Wenzel placed no reliance whatever in the power of any remedies to dissipate a cataract, and, as he had remarked their inefficacy in numerous instances, he felt authorized in declaring, that internal remedies, either of the mercurial, or any other kind, are inadequate to the cure of this disorder; and equally so, whether the opacity be in the crystalline, or in the capsule, whether incipient, or advanced.

Although Mr. Ware coincides with Wenzel, in regard to the uncertainty of all known medicines to dissipate an opacity, either in the crystalline, or its capsule, or even to prevent the progress of such opacity, when once begun, yet, many cases have proved, that the powers of nature are often sufficient to accomplish these purposes. The opacities, in particular, which are produced by external violence, Mr. Ware has repeatedly seen dissipated in a short space of time, when no other parts of the eye have been hurt. In such cases, the crystalline lens has generally been absorbed, as is proved by the benefit, which has afterwards been derived from deeply convex glasses. In some of these cases, though the crystalline has been dissolved, the greater part of the capsule has remained opaque, and the light has been transmitted to the retina only through a small aperture, which has become transparent in its centre. Instances are also not wanting, in which cataracts, formed without any violence, have been suddenly dissipated in consequence of an accidental blow on the eye. The remedies, which Mr. Ware has found more effectual, than others, have been the application to the eye itself of one, or two drops of æther, once, or twice, in the course of the day, and the occasional rubbing of the eye, over the lid, with the point of the finger, first moistened with a weak volatile, or mercurial liniment.

Cataracts are usually cured, either by removing the opaque lens, from the axis

of vision by means of a needle; or by extracting the lens from the eye, through a semicircular incision, made at the lower part of the cornea. The first operation is termed *couching*, or *depression of the cataract*; the second is named *extraction*. Some account of the congenital cataract, and method of operating upon children, will be found in the future part of the present article.

EXTRACTION OF THE CATARACT.

As soon as it was fully proved, that the true cataract was an opacity, of the crystalline humour, that the loss of sight would not be occasioned by the removal of this humour, that the cornea may be divided without danger, and that, if the aqueous humour be discharged, it will be quickly regenerated, the mode of cure, by extracting the cataract out of the eye, would naturally present itself to the mind. (*Wenzel*.)

Freitag was the first operator, who made an attempt to extract the cataract, about the close of the 17th century. After him Lotterius of Turin, performed this operation. Daviel first communicated this method to the public. And the ingenuity and industry of Wenzel brought this mode of operating to a state of perfection never before attained. (*Brambilla Instrumentarium Chirurgicum Austriacum*, 1782, p. 71.)

Wenzel's knife resembles the common lancet employed in bleeding, excepting that its blade is a little longer, and not quite so broad. Its edges are straight, and the blade is an inch and a half (eighteen lines) long, and a quarter of an inch (three lines) broad, in the widest part of it, which is at the base. From hence it gradually becomes narrower towards the point; so that this breadth of a quarter of an inch extends only to the space of about one-third of an inch from the base; and, for the space of half an inch from the point, it is no more than one-eighth of an inch broad.

The lower edge of the knife, by which is meant, that which is lowest during the operation, is sharp through the whole length of the blade. At the distance of a quarter of an inch from the base, this lower edge has a slight projection, which is of use in making the section through the cornea. The upper edge Wenzel divides into three portions. For the space of five-sixths of an inch from the basis, this edge is blunt, and very slightly flattened. For the space of half an inch, or rather six lines and a half, further towards the point, it is blunt and rounded; although to the naked eye this part ap-

pears sharp, on account of its being very thin. And the extremity of this edge, to the extent of one-eighth of an inch from the point, is keen, like the lower edge, in order to facilitate the conveyance of the instrument through the cornea.

The swelling in the middle of the blade is merely intended to prevent the instrument from breaking. The handle, in which the blade is fixed, has eight sides, which are alternately large and small. This form enables the operator to hold the instrument more firmly, which is not so apt to turn round in the hand. It is generally three inches and two-thirds in length, and, from two lines, to two and a half, in thickness. The blade is so fixed in the handle, that the two sides of the former lie parallel with the broadest side of the latter. On the upper side of the handle, which answers to the upper, or blunt edge, of the knife, a small mark is placed, which directs the proper manner, in which the instrument should be held in performing the operation.

The shape of this knife is well calculated to effect the division of the cornea, with the utmost ease and safety, as it cuts this membrane, in proportion as it enters the eye. (*Wenzel*.)

The knife employed by Mr. Ware, is, in regard to its dimensions, not unlike the instrument employed by the Baron. The principal difference between them is, that Mr. Ware's knife is less spear-pointed; in consequence of which, when this latter instrument has pierced through the cornea, its lower, or cutting edge will sooner pass below the inferior margin of the pupil, than the knife used by Wenzel. On this account, Mr. Ware is of opinion, that the iris will be less likely to be entangled under the knife, which he recommends, than under Wenzel's when the instrument begins to cut its way downwards, and the aqueous humour is discharged. Mr. Ware particularly advises great care to be taken to have the knife increase gradually in thickness from the point to the handle; by which means, if it be conducted steadily through the cornea, it will be next to an impossibility, that any part of the aqueous humour should escape, before the section is begun downwards; and, consequently, during this time, the cornea will preserve its due convexity. But, if the blade should not increase in thickness from the point; or if it be incurved much in its back, or edge, the aqueous humour will unavoidably escape, before the puncture is completed; and the iris, being brought under the edge of the knife, will be in a great danger of being wounded by it. (*Ware*.)

Baron Wenzel considers all instru-

ments, invented for fixing the eye, quite unnecessary; they render the operation more complicated, more dreadful to the patient, more embarrassing to the operator, and they are very liable to irritate and wound the eye. If the above oculist would approve of any kind of speculum, he should give the preference to Rum-pelt's instrument, which is nothing more than a thimble, at the end of which is a sharp pointed instrument, like the pique of Parnard. The thimble is to be placed on the middle finger of the operator, and it has the advantage of not obstructing the use of the forefinger, but leaves it at liberty to keep down the lower eyelid.

The pressure, occasioned by all contrivances for fixing the eye, is a serious objection to their employment, as such pressure is apt to cause a sudden protrusion and loss of great part of the vitreous humour. (*Wenzel*.)

Mr. Ware coincides very much with Wenzel on the subject of specula. At the same time, he remarks, that, in some instances of children born with cataracts, he has been obliged to fix the eye with a speculum; without the aid of which, he has found it totally impracticable to make the incision through the cornea, with any degree of precision, or safety. His speculum is an oval ring, the longest diameter of which is about twice as long as the diameter of the cornea, and the shortest about half as long again as this tunic. Annexed to the upper rim of the speculum is a rest, or shoulder, to support the upper eyelid; and, by its lower rim, it is fixed to a handle of such a length, and bent in such a way, as may render it convenient to be held. (*Ware*.)

When the patient is to undergo the operation, he should be seated in a low chair, before a light, which is not too bright, and, which, consequently, does not occasion too great a contraction of the pupil. The sound eye being covered with a compress, an assistant, placed behind, must hold the patient's head, and support it on his breast. With the forefinger of the hand that is at liberty, he is then to raise the upper lid of the eye to be operated upon, and gently press the tarsus, with the extremity of the finger, against the upper edge of the orbit, avoiding all undue pressure on the eye.

The operator is to be seated in a chair, a little higher, than that of the patient. The eyes naturally turning towards the light, he is to place the patient's head obliquely at a window, so that the eye to be operated upon may be inclined towards the outer angle of the orbit. This position will enable the operator to bring out

the knife, on the inner side of the cornea, opposite to the part, where it pierces this tunic, more exactly than he would otherwise be able to do. The operator is to rest his right foot on a stool, placed near the patient, that his knee may be raised high enough to support the right elbow, and to bring the hand, with which he holds the knife to a level with the eye, on which he is to operate. He is then to take the cornea knife in his right hand, if it be the left eye, on which he is to operate, and, *vice versa*, in the left hand, if it be the right eye. The knife is to be held like a pen in writing, and the hand is to rest steadily on the outer side of the eye, with the little finger, separated a little from the rest, on the edge of the orbit. In this position, the operator should deliberately wait, till the eye becomes quite still. (*Wenzel*.)

When the eye is perfectly quiet, and so turned towards the outer angle, that the inner and inferior part of the cornea can be distinctly seen, through which Wenzel recommends the point of the knife to be conveyed, the operator is to plunge the knife into the upper and outer part of this tunic, a quarter of a line distant from the sclerotica, in such a direction, that it may pass obliquely from above, downwards, parallel to the plane of the iris. At the same time, the operator must depress the lower lid with his fore and middle fingers, taking care to avoid all pressure on the eyeball. (*Wenzel*.)

Mr. Ware does not approve of this plan of leaving the eye unfixed, while the incision is made through the cornea. The danger likely to arise from undue pressure, can only take place, after the instrument has made an opening into the eye; but, the pressure, which Mr. Ware advises, in order to fix the eye, is to be removed the instant the knife is carried through the cornea, and before any attempt is made to divide this tunic downwards. To understand this subject better, however, the reader should know, that Mr. Ware divides the incision of the cornea into two distinct processes; the first of which may be called *punctuation*, and the second *section*. So long, says Mr. Ware, as the knife fills up the aperture, in which it is inserted, that is, until it has passed through both sides of the cornea, and its extremity has advanced some way beyond this tunic, the aqueous humour cannot be discharged, and pressure may be continued with safety. The punctuation of the cornea being completed, the purpose of pressure is fully answered; and if such pressure be continued, when the section of the cornea begins, instead of being useful, it will be

hurtful. To avoid all bad effects, Mr. Ware recommends the cornea to be cut in the following way.

The operator is to place the fore and middle finger of the left hand, upon the tunica conjunctiva, just below, and a little on the inside of the cornea. At the same time, the assistant, who supports the head, is to apply one, or, if the eye projects sufficiently, two of his fingers, upon the conjunctiva, a little on the inside and above the cornea. The fingers of the operator and assistant, thus opposed to each other, will fix the eye, and prevent the lids from closing. The point of the knife is to enter the outside of the cornea, a little above its transverse diameter, and just before its connexion with the scleroticæ. Thus introduced, it is to be pushed on slowly, but steadily, without the least intermission, and in a straight direction, with its blade parallel to the iris, so as to pierce the cornea towards the inner angle of the eye, on the side, opposite to that, which it first entered, and till about one-third part of it is seen to emerge beyond the inner margin of the cornea. When the knife has reached so far, continues Mr. Ware, the punctuation is completed. The broad part of the blade is now between the cornea and the iris, and its cutting edge below the pupil, which of course is out of all danger of being wounded. As every degree of pressure must now be taken off the eyeball, the fingers, both of the operator and his assistant, are instantly to be removed from this part, and shifted to the eyelids.—These are to be kept asunder by gently pressing them against the edges of the orbit; and the eye is to be left entirely to the guidance of the knife, by which, says Mr. Ware, it may be raised, depressed, or drawn to either side, as may be found necessary. The aqueous humour being now partly, if not entirely evacuated, and the cornea of course rendered flaccid, the edge of the blade is to be pressed slowly downward, till it has cut its way out, and separated a little more, than half the cornea from the scleroticæ, following the semicircular direction, marked out by the attachment of the one to the other.—(Ware.)

As soon as the point of the knife had arrived opposite the pupil, Wenzel used to incline it gently backward, and thus puncture the capsule of the crystalline. But, Mr. Ware very properly objects to this method of opening the capsule with the instrument used for cutting the cornea, and at the same time. The plan may exhibit dexterity; but it is of no use, and is often attended with considerable danger of wounding the iris.

In the eyes of some persons, the iris is convex, and it is almost impossible to complete the section of the cornea, without entangling the iris under the edge of the knife, unless a particular artifice be adopted. Wenzel, in this circumstance, recommends gently rubbing the cornea downward with the finger: one of the most important directions, according to Mr. Ware, in the Baron's whole book.

Wenzel imputed several advantages to the oblique manner, in which he used to divide the cornea. The best modern oculists, however, do not attribute any superior uses to this method, and consequently do not imitate it.

If the edge of the knife should incline too much forward, and its direction be not altered, the incision in the cornea will be too small, and terminate almost opposite the pupil. In this case, there will be great difficulty in extracting the cataract, and the cicatrix afterwards will often obstruct sight. If, on the contrary, the edge of the instrument be inclined too much backward, and its direction be not changed, the incision will approach too near the part, where the iris and scleroticæ unite, and there will be great danger of wounding one, or the other of these coats of the eye. Both these accidents may be prevented by gently rolling the instrument between the fingers, until the blade takes the proper direction. (Wenzel.)

Mr. Ware has seen operators, through a fear of wounding the iris, introduce and bring out the instrument at a considerable distance before the union of the cornea and scleroticæ; in consequence of which, the incision from one side of the cornea to the other has been made too small to allow the easy extraction of the cataract, although from above downward, it was fully large enough for this purpose. Mr. Ware has also sometimes observed, that though the punctuation of the cornea, from side to side, has been properly conducted, and its section, afterwards, to all appearance, effectually completed, yet, on account of the frictions, employed to disengage the iris from the edge of the instrument, the knife, in cutting downward, has been carried between the layers of the cornea, and, consequently, though the incision has appeared externally, to be of its proper size; internally, it has been much too small for allowing the cataract to be easily extracted. In this case, the incision must be enlarged, by means of a pair of curved blunt-pointed scissors, which should be introduced at the part, where the knife first entered the cornea. (Ware.)

After the knife has pierced through the

cornea, and while it is cutting its way downward, the assistant, to whose care the upper eyelid is entrusted, is gradually to let it drop, in order to prevent the cataract from escaping too hastily. Then the whole charge of the eye devolves solely on the operator, who is to solicit the extraction of the cataract by gentle pressure on the upper part of the globe, the capsule of the crystalline having been previously opened.

Wenzel himself does not recommend opening the capsule of the crystalline, in every instance, at the same time, that the cornea is cut. In cases, where the pupil is much contracted, as well as in those, where the muscles of the eye and eyelids are easily thrown into convulsions, it is improper, says he, to puncture the capsule when the section is made through the cornea. This is also improper when the space, between the crystalline, and the iris, termed the posterior chamber, is large. In all such cases, Wenzel acknowledges, that it is better simply to divide the cornea in the first instance, and then to puncture the capsule with a different instrument.

Wenzel and his father used to employ, for this purpose, a flat needle, one line, that is, one twelfth part of an inch, in diameter, having its cutting extremity a little incurvated. This needle, which should be made of nealed gold, that its pliability may allow the operator to bend it in different directions, as occasion requires, is fixed in a handle, two inches and a half in length, and similar to that of the cornea knife. At the other extremity of the same handle a small curette, or scoop, is fixed, made also of nealed gold, which is of use to extract the cataract.

When the crystalline, dislodged from its capsule, protrudes through the wound in the cornea, its removal from the eye may sometimes be assisted by the use of the above needle; and afterwards the opaque and glutinous matter, remaining, must be removed by means of the curette.

It is always advisable, after the operation, gently to rub the anterior part of the cornea over the lids, either with the thumb, or the curette. This process usually collects in the centre of the pupil some small fragments of opaque matter, which the crystalline leaves behind it, and which, if not taken away with the curette, might give rise to a particular kind of secondary cataract. The curette is also of use for replacing the iris, a portion of which membrane occasionally comes through the incision in the cornea. (*Wenzel.*)

Sometimes the cataract is hindered from coming out, on gentle pressure being made,

in consequence of adhesions. Wenzel recommends these to be broken by means of the golden needle, introduced under the cornea, and applied in different directions, according as the case requires, and more especially round the circumference of the crystalline.

Sometimes, when the capsule of the crystalline is destroyed, and the crystalline itself is perfectly free, this humour plunges to the inferior part of the vitreous humour, leaving only its upper edge visible through the pupil. The hyaloid membrane is also most commonly destroyed, and the vitreous humour in a state of fluidity. All pressure, therefore, on the eyeball, must be avoided, since this would produce a large evacuation of the vitreous humour. The only method is to introduce through the pupil, a small steel hook to take hold of the crystalline, which, in this case, is often very small, and with this instrument to extract it from the eye. (*Wenzel.*)

When the capsule used to become opaque after the operation, so as to form, what is termed, the secondary membranous cataract, Wenzel, after dividing the cornea, used to remove the opaque substance, by means of a small pair of forceps.

After the operation, no fluid application, according to Wenzel, should be made to the eye. It should be simply covered with a dossil of lint; over which a dry compress should be applied. The dressings should in general be removed every day.

Mr. Ware, however, approves of fluid applications. He has found, that a dossil of lint, steeped in plain water, or brandy and water, and covered with the spermaceti, or saturnine cerate, and removed once every day, is the most easy and convenient dressing, that can be applied after the operation. The cerate over the lint prevents the latter, when impregnated with the discharge, from becoming stiff, and irritating the lids. Mr. Ware thinks the mode of applying the compress and bandage over the eye, a circumstance of no small importance, because, if too loose, the dressings are very apt to slip off; and, consequently, to press unequally and injuriously on the eye; and, if too tight, the undue pressure will excite pain and inflammation, and even force out some of the vitreous humour. Mr. Ware's compress is made of soft linen, folded, two or three times, wide enough to cover both eyes, and sufficiently long to extend from the upper part of the forehead to the lower part of the nose. This he pins at the top of the patient's night-cap; and its lower part, which is divided

in the middle, to allow the nose to come through it, he lays loosely over the eyes. The bandage, also made of old linen, and as broad as six fingers, he carries round the head over the compress, and pins to the side of the night cap moderately tight. A slip of linen is afterwards carried under the chin and pinned, at each end, to the side of the bandage, to prevent it from slipping upwards. (*Ware.*)

The patient should lie continually on his back, after the operation, as this posture has a tendency to prevent the escape of the humours.

Mr. Ware has published a very able enquiry into the causes preventing the success of extraction of the cataract.

The first, which he considers, is making the incision through the cornea too small. In this circumstance a degree of violence will be required to bring the cataract through the wound; and, if the cataract be not altered in its figure, the wound will be forcibly dilated, and the edge of the iris compressed between the cornea and the cataract. In this way, either some of its fibres may be ruptured, or it may be otherwise so much injured, as to excite a considerable degree of inflammation, and even induce, in the end, a closure of the pupil.

This accident may arise from the operator's cutting the cornea, without being able to see exactly the position of this membrane, in consequence of the eye having turned inward, owing to its not being properly fixed. The fault may also proceed from the incision having been begun below the transverse diameter of the cornea. In this manner, nine-sixteenths, or rather more than half of the circumference of this membrane, will not be divided; which extent the incision ought always to occupy, in order to allow the cataract to be extracted with facility.

When the cornea is remarkably flat, and the iris projects unusually forward in the anterior chamber, however, Mr. Ware recommends including only one-third of the cornea in the first incision, and afterwards enlarging the aperture, on the outer side, by means of curved scissors.

Whenever the wound in the cornea is made too small, it should always be enlarged before proceeding further in the operation; and this can be best accomplished with a pair of curved blunt-pointed scissors, on the outer side of the cornea, where the knife first made its entrance.

Taking care to fix the eye in Mr. Ware's way, is certainly of great consequence in hindering the wound in the cornea from being made too small.

Wounding the iris with the cornea knife, is the second accident, which Mr. Ware

considers. The principal cause seems to him to be a discharge of the aqueous humour, before the knife has passed through the cornea low enough to hinder the lower part of the iris, which forms the inferior rim of the pupil, from getting beneath the edge of the instrument. The escape of the aqueous humour may be owing to some inaccuracy in the shape of the knife, or unsteadiness in introducing it. The falling of the lower part of the iris under the edge of the knife, Mr. Ware believes, cannot always be prevented by the utmost skill, or precaution of the operator. Happily, however, says he, we have been taught, that the iris may be reinstated, after it has been thus displaced, and without suffering any injury, by applying gentle friction on the cornea, over the entangled part, with the point of the finger.

By unsteadiness in passing the knife, Mr. Ware means, that the knife may not only be suffered to make a punctuation through this tunic, but, that its edge may, at the same time, be unintentionally pressed downward, so as to make an incision likewise; in consequence of which downward motion of the knife, an aperture must unavoidably be left in the cornea, through which the aqueous humour will escape. If the cornea-knife increase through its whole length, both in width and thickness, and if it be merely pushed through the cornea, no space will be left, through which any fluid can escape.

The third accident, noticed by Mr. Ware, is the escape of the vitreous humour. The common occasion of this occurrence is the undue application of pressure. It may take place, either when the incision is made through the cornea, or at the time of extracting the cataract out of the eye. Some eyes are subject to spasm; which renders them much more liable to this accident. To prevent it, Mr. Ware recommends every kind and degree of pressure to be taken from the eye, before the knife has completely cut its way through the cornea. And, as soon as the knife has proceeded sufficiently low to secure the iris from being wounded, the operator should not only take heed, that his own fingers do not touch the eye, but should also direct the assistant, who supports the upper lid, to remove his fingers entirely from this part. The assistant seldom need make any pressure on the globe of the eye: however, when there is room for one of his fingers to be placed on the inner and upper part of the globe, without interfering with those of the operator, the method may be followed, in order to make the eye still more fixed. But immediately the punctuation of the cornea is completed, the assistant's finger

should always be entirely removed, both from the eyelids and eye itself.

Notwithstanding the upper lid is left thus free, there will be sufficient space between it and the lower lid, to allow the progress of the knife to be seen; and, in finishing the wound, the operator should depress the lower lid with great gentleness.

The vitreous humour may also be lost, in consequence of opening the capsule of the lens nearer the circumference, than the centre of the pupil. As the crystalline is both thinner and softer at that part, the instrument will be liable to pass through both sides of the capsule, and enter the vitreous humour. This humour having no longer any barrier to its escape, is liable to be forced out by the action of the eyelids alone; and, when pressure is afterwards made, to bring the cataract through, a much greater quantity will be lost, and the cataract, instead of coming forward, will recede from the pupil. The only way to extract it now, is, by having the upper lid gently raised by an assistant, (a rare instance, in which this is necessary after cutting the cornea) while the operator, either with the fore-finger of the left hand, or with the blunt end of the curette, applied beneath the incision in the cornea, prevents the cataract from sinking further. Then, with his right hand, let him introduce a hook under the flap of the cornea, and with its point carefully entangle the cataract, and bring it away.

To prevent, however, such difficulties, Mr. Ware very judiciously advises never attempting to puncture the capsule, until the whole pupil is in view. This gentleman is in the habit of opening the capsule with a gold-pointed needle, arched towards its extremity. Wenzel's needle, for this purpose, is flat at its extremity: Mr. Ware's is pointed: and this is their only difference. The latter introduces his instrument under the flap of the cornea, with its arched part uppermost, until its point is on a level with the centre of the pupil. The end of the instrument should then be turned inward, and gently rubbed on the capsule of the crystalline, until it pierces it. In a few instances, Mr. Ware has found the capsule so tough, that the point of the gold needle would not enter it, and he has been obliged to use a sharp steel instrument, of the same shape as the gold-pointed one.

The vitreous humour may also be lost, at the time of extracting the cataract, and the usual cause is an undue application of pressure. All violent pressure is quite unnecessary for forcing out the cataract, when the wound in the cornea is sufficiently large. When the wound is too small,

it should be enlarged as above directed. If pressure be continued at all after the cataract is extracted, the capsule of the vitreous humour will certainly be ruptured, and some of this part of the eye protruded. Pressure may even rupture the capsule of the vitreous humour, before the cataract is brought through the incision in the cornea; and the same consequences will ensue, and the same practice be necessary, as in the case, in which the operator has unskilfully opened the capsule of the vitreous humour with the needle, in attempting to open that of the lens.

In taking away fragments of opaque matter, remaining behind, by means of the curette, great care is requisite to avoid wounding the posterior part of the capsule of the crystalline with the end of the instrument, so as to open a way for the escape of the vitreous humour.

The vitreous humour may, indeed, be forced out, after the extraction of the cataract, merely by a spasmodic action of the eyelids. On this subject, Mr. Ware, after hinting his suspicion, that, in a case of this kind, which he saw, the assistant's keeping up the lid contributed to the event, repeats his advice, "that the upper eyelid should be raised solely by the fingers of the left hand of the operator," after cutting the cornea.

Mr. Ware seems to think, that more evil has resulted from the operator's being deterred, by the readiness, with which the vitreous humour continues to start out, from ascertaining, that all the fragments of the cataract are removed, and that the whole of the iris has resumed its position, than from the mere loss of the vitreous humour, which is quickly regenerated.

Mr. Ware afterwards takes notice of the accident of extracting only a part of the cataract, and leaving the remainder behind. He is an advocate for removing all opaque substances from the pupil, except an extreme degree of irritability, to which some eyes are subject, should render the introduction of every sort of instrument, after the cataract is extracted, difficult and dangerous. Mr. Ware usually removes opaque portions of the cataract by means of a curette; and, occasionally, when the opaque substance has been large, and has adhered to the capsule, he has been obliged to extract it with small forceps. Before finishing the operation, Mr. Ware approves of always rubbing the end of the finger gently on the fore part of the eye, over the eyelids; which proceeding tends to bring in view any opaque matter, which may previously lie behind the iris: Mr. Ware relates a case, proving, that such opacities as cannot be removed in

the operation, are capable of being absorbed.

This gentleman says, that an opacity of the capsule can be the only reason for removing it. The anterior part, also, can alone become the object of the operator's attention: its posterior part is necessarily hidden, while the cataract remains in the eye, and afterwards, if discovered to be opaque, it is so closely connected with the capsule of the vitreous humour, that Mr. Ware believes it cannot be removed by any instrument, without hazarding a destructive effusion of this humour.

When, however, the opaque lens, is accompanied with an opacity in the front part of the capsule, Mr. Ware recommends the following plan. After cutting the cornea, as usual, a fine-pointed instrument, somewhat smaller in size than a round couching needle, and a little bent towards the point, should be introduced under the flap of the cornea, with its bent part upward, until its point is parallel with the aperture of the pupil. The point should then be turned toward the opaque capsule, which is to be punctured by it, in a circular direction, as near to the rim of the pupil as the instrument can be applied, without hurting the iris. Sometimes, the part included within the punctures, may be extracted on the point of the instrument; and, if this cannot be done, it should be removed with a small pair of forceps. The lens, whether opaque, or transparent, should next be extracted, by making a slight pressure with the curette, either above, or below, the circumference of the cornea.

Mr. Ware afterwards considers the bad consequences of allowing foreign bodies of any kind, after the operation, to press unequally on the globe of the eye; comprehending, under this head, the intervention of the edge of the lower eyelid between the sides of the divided cornea; the inversion of the edge of the lower eyelid; and the lodgment of one, or more, loose eyelashes on the globe of the eye.

To prevent the first accident, every operator, before applying the dressings, should carefully depress the lower eyelid; and, before he suffers the lid to rise, should take care, that the flap of the cornea be accurately adjusted in its proper position; and, that the upper lid be dropped, so as completely to cover it. After this, the eyelids should not be opened again, for three, or four days, that is, until there is good reason to suppose the wound in the cornea closed. (*Ware.*)

The inversion of the lower eyelid is butiful, in consequence of its making the eyelashes rub against the eye. These should be extracted the day before the

operation. For the mode of effecting a permanent cure, see *Trichiasis*.

Besides the danger, to which the eye is exposed, from the inversion of the edge of the lid, the eye may receive injury from the improper position of the eyelashes alone; one, or more of which, during the operation, may happen to bend inwards; or, becoming loose, may afterwards insinuate themselves between the inside of the lid and the eye. An eyelash bent inward, should be rectified; if broken off and loose, it should be removed, before dressing the part.

Mr. Ware lastly considers prematurely exposing the eye to a strong light. He censures the plan of opening the eyelids, within the first two or three days after the operation, because the stimulus of the light increases the ophthalmia, and the method is apt to disturb the wound in the cornea, before it is closed. Mr. Ware, however, wishes it not to be inferred, that he is an advocate for long confinement after the operation. His mode is to keep the patient wholly in bed, and to direct him to move his head, as little as possible, for the first three days after the operation. During this time, a dossil of wet lint is kept on his eyes, covered with a saturnine plaster, compress, and bandage, as already described. The dressing is renewed once every day, and the outsides of the eyelids washed with warm water in winter, and cold in summer. At each time of dressing, the skin of the lower lid is drawn gently down to prevent any tendency to an inversion. Animal food is prohibited, and the patient enjoined not to talk much. On the fourth day, he is permitted to sit up, for two, or three hours, and, if he has had no stool since the operation, a mild opening medicine is now administered. On the fifth, the time of his sitting up is lengthened, and, presuming that the wound in the cornea is now closed, Mr. Ware usually examines the state of the eye. After this, no dressings need be applied in the day-time, care being taken to defend it from a strong light, by a pasteboard hood, or shade, and by darkening the room, so that no inconvenience is felt. The patient may now also look, for a short time, at large objects. The following part of the treatment need interfere very little with the wishes of the patient, unless unexpected accidents should occur. (*Ware.*)

OF COUCHING, OR DEPRESSION OF THE CATARACT.

This operation consists in removing the opaque lens out of the axis of vision, by means of a needle, constructed for the purpose.

There are two couching needles, which now seem to be preferred to all others: and these are the only ones requiring a description here. I allude to the one used by Mr. Hey; and to that employed by Professor Scarpa.

The length of Mr. Hey's needle is somewhat less than an inch. It would be sufficiently long if it did not exceed seven-eighths of an inch. It is round, except near the point, where it is made flat by grinding two opposite sides. The flat part is ground gradually thinner to the extremity of the needle, which is semi-circular, and ought to be made as sharp as a lancet. The flat part extends in length, about an eighth of an inch, and its sides are parallel. From the part where the needle ceases to be flat, its diameter gradually increases towards the handle. The flat part is one-fortieth of an inch in diameter. The part which is nearest the handle, is one-twentieth of an inch. The handle, which is three inches and a half in length, is made of light wood, stained black. It is octagonal, and has a little ivory inlaid in the two sides, which correspond with the edge of the needle.

Mr. Hey describes the recommendations of this instrument in the following terms:

1. "It is only half the length of the common needle; and this gives the operator a greater command over the motions of its point, in removing the crystalline from its bed, and tearing its capsule. It is also of some consequence, that the operator should know how far the point of his needle has penetrated the globe of the eye, before he has an opportunity of seeing it through the pupil; as it ought to be brought forwards when it has reached the axis of the pupil. Now he may undoubtedly form a better judgment respecting this circumstance, when the length of his needle does not much exceed the diameter of the eye, than when he uses one of the ordinary length, which is nearly two inches. The shortness of the needle is peculiarly useful, when the capsule is so opaque that the point cannot be seen through the pupil.

2. "As this needle becomes gradually thicker towards the handle, it will remain fixed in that part of the sclerotic, to which the operator has pushed it, while he employs its point in depressing and removing the cataract. But the spear-shaped needle, by making a wound larger in diameter, than that part of the instrument, which remains in the sclerotic, becomes unsteady, and is with difficulty prevented from sliding forwards against the ciliary processes, while the operator is giving it

those motions which are necessary for depressing the cataract.

"On the same account the common spear-shaped needle may suffer some of the vitreous humour to escape during the operation, whereby the iris and ciliary processes would be somewhat displaced, and rendered flaccid; whereas the needle which I use, making but a small aperture in the sclerotic, and filling up that aperture completely during the operation, no portion of the vitreous humour can flow out so as to render the iris and ciliary processes flaccid.

3. "This needle has no projecting edges: but the spear-shaped needle, having two sharp edges, which grow gradually broader to a certain distance from its point, will be liable to wound the iris, if it be introduced too near the ciliary ligament, with its edges in a horizontal position. I have been informed, that, in an operation performed by one of the most eminent surgeons in the metropolis, now deceased, the iris was divided as far as the pupil. If the operator, in order to avoid this danger, introduces his needle with its edges in a vertical position, he will divide the fibres of the sclerotic transversely, and, by thus enlarging the wound, will increase the unsteadiness of the instrument. Besides, however the needle be introduced, one of its sharp edges must be turned towards the iris in the act of depressing the cataract; and, in the various motions which are often necessary in this operation, the ciliary processes are certainly exposed to more danger, than when a needle is used which has no projecting edge.

4. "It has no projecting point. In the use of the spear-shaped needle, the operator's intention is to bring its broadest part over the centre of the crystalline. In attempting to do this, there is great danger of carrying the point beyond the circumference of the crystalline, and catching hold of the ciliary processes, or their investing membrane, the *membrana nigra*. This accident is the more probable, as the point of the needle must unavoidably be directed obliquely forwards, and this motion, if carried too far, bring the point into contact with the ciliary processes, as they surround the capsule of the crystalline.

"A needle, made according to the figure given in the annexed plate, will pass through the sclerotic with ease. It will depress a firm cataract readily, and break down the texture of one that is soft. If the operator finds it of use to bring the point of the needle into the anterior chamber of the eye (which is often the case,) he may do this with the greatest safety,

for the edges of the needle will not wound the iris. In short, if the operator, in the use of this needle, does but attend properly to the motion of its point, he will do no unavoidable injury to the eye, and this caution becomes the less embarrassing, as the point does not project beyond that part of the needle by which the depression is made, the extreme part of the needle being used for this purpose." (*Mem.*)

Scarpa employs a very slender needle, possessing sufficient firmness to enter the eye without hazard of breaking, and having a point, which is slightly curved. The curved extremity of the needle is flat upon its dorsum, or convexity, sharp at its edges, and has a concavity constructed with two oblique surfaces, forming in the middle a gentle eminence, that is continued along to the very point of the instrument; there is a mark on the side of the handle, which corresponds to the convexity of the point. The surgeons of the Leeds Infirmary have had one advantage in the needle, which they have used in imitation of Baron Hülmer; I mean, having it made of no greater length than the purposes of the operation demand. A couching needle is sufficiently long when it does not exceed, at most, an inch in length: this affords the operator a greater command over the motions of the point, and enables him to judge more accurately, how far it has penetrated the globe of the eye, before he has an opportunity of seeing it through the pupil. To the needle, therefore, so much recommended by Scarpa, and so successfully used by him, and Doctor Morigi, principal surgeon of the hospital at Piacenza, and one of the most expert operators of the present day in Italy, it seems proper to unite the improvement of having it made no longer than is necessary. The needle here described, will penetrate the sclerotic coat as readily as any straight one, of the same diameter, and, by reason of its slenderness, will impair the internal structure of the eye less in its movements than common couching needles. When cautiously pushed in a transverse direction, till its point has reached the upper part of the opaque lens, it becomes situated with its convexity towards the iris, and its point in an opposite direction; and, upon the least pressure being made by its convex surface, it removes the cataract a little downward, by which a space is afforded at the upper part of the pupil, between the cataract and ciliary processes, through which the instrument may be safely conveyed in front of the opaque body and its capsule, which it is prudent to lacerate in the operation. In cases of caseous, milky, and membranous cata-

racts, the soft pulp of the crystalline may be most readily divided, and broken piecemeal by the edges of its curved extremity; and the front layer of the capsule lacerated into numerous membranous flakes, which, by turning the point of the instrument towards the pupil, may be as easily pushed through this aperture into the anterior chamber, where Scarpa finds absorption takes place more quickly, than behind the pupil.

In ordinary cases, there is not the least occasion for any preparatory treatment previous to the operation; all that prudence requires is, that the patient should abstain from animal food and fermented liquors, for a few days before submitting to it, and should take one dose of a gentle purgative. But this, like every other general observation, is liable to particular exceptions. Hypochondriacal men, hysterical women, and patients subject to affections of the stomach and nervous system, should take, for two or three weeks before the operation, tonic bitter medicines, particularly the infusion of quassia, either with, or without a few drops of the æther vitriolicum to each dose; or, in other cases, ℥j of Peruvian bark, with ℥j of valerian, may be administered two or three times a day with particular benefit. It is observed by the most accurate writers upon this subject, that in such persons the symptoms consequent to operations upon the eyes, are often much more violent than in common cases; and it therefore seems proper to endeavour, previously, to meliorate their constitutions. When the patient is timid; it is very advisable to give him, half an hour before the time of operating, about fifteen drops of the *tinctura opii*, with a little wine.

Some patients, besides being afflicted with cataracts, have the edges of the eyelids swollen and gummy, with relaxation, and chronic redness of the conjunctiva. In this case, before undertaking to couch, it is advisable to apply a blister to the nape of the neck, and to keep it open for two or three weeks, by means of the Savin cerate, and to insinuate every morning and evening, between the palpebræ and globe of the eye, a small quantity of the unguentum hydrarg. nitr. mitius, prepared according to the pharmacopœia of St Bartholomew's Hospital, increasing its strength gradually. (℞. Unguenti hydrargyri nitrati, ℥iv. Adipis Suillæ ℥viij. Olei Olivæ, ℥ij.) In obstinate cases, when this ointment does not produce the desired effect, an ointment recommended by Janin, (*Memoires sur l'Oeil*) should be substituted: it consists of ℥ss of hog-lard, ℥ij of prepared tutty, ℥ij of arme-

nian bole, and $\mathfrak{z}\text{i}$ of the white calx of quicksilver. At first, care should be taken to use it lowered, with twice or thrice its quantity of lard. In the daytime, a collyrium, composed of $\mathfrak{z}\text{iv}$ of rosewater, $\mathfrak{z}\text{ss}$ of the mucilage of quince seeds, and gr. v of the sulphate of zinc, may also be frequently used with considerable advantage. By such means the morbid secretion from the Meibomian glands, and membranous lining of the eye-lids, will be checked, and the due action of the vessels, and natural flexibility of the eye-lids, will be restored. (*Saggio di Osservazioni, &c. sulle principali malattie degli occhi. Venez. 1802.*)

FIRM CATARACT.

In the operation, the patient should be seated rather low, opposite a window where the light is not vivid, and in such a manner that the rays may fall laterally upon the eye about to be couched. The other eye, whether in a healthy or diseased state, ought always to be closed, and covered with a handkerchief, or any thing convenient for the purpose; for, so strong is the sympathy between the two organs, that the motions of the one constantly produce a disturbance of the other. The surgeon should sit upon a seat rather higher than that upon which the patient is placed; and, to give his hand a greater degree of steadiness in the various manœuvres of couching, he will find it useful to place his elbow upon his knee, which must be sufficiently raised for this purpose, by a stool placed under the foot. The chair, on which the patient sits, ought to have a high back, against which his head may be so firmly supported, that he cannot draw it backward during the operation. The back of the chair must not slope backward, as that of a common one, but be quite perpendicular, in order that the patient's head may not be too distant from the surgeon's breast. (*Richter's Anfangsgrunde der Wundarzneykunst, P. 207. 3 Band.*)

The propriety of supporting the patient's head rather upon the back of the chair, on which he sits, than upon an assistant's breast, must immediately strike every impartial mind; for, as Bischoff has observed, the least motion of the assistant, even that necessarily occasioned by respiration, causes, also, a synchronous motion of the part, supported on his breast, which cannot fail to be disadvantageous, both in the operation of extraction, and of couching. Hence Callisen and Richter have recommended the same method of supporting the patient's head,

as I have here submitted to public consideration.

In certain cases, where the muscles of the eye, and eyelids, are incessantly affected with spasm; or, where the eye is peculiarly diminutive, and sunk, as it were, in the orbit, the elevator for the upper eyelid, invented by Pellier, and approved by Scarpa, may possibly prove serviceable; in operating upon young subjects, I think it might contribute much to facilitate the operation.

The couching needle (if the curved one) is to be held with the convexity of its curvature forward; its point backward; and its handle parallel to the patient's temple. The surgeon having directed the patient to turn the eye towards the nose, is to introduce the instrument boldly through the sclerotic coat, at the distance of not less than two lines from the margin of the cornea, for fear of injuring the ciliary processes. Most authors advise the puncture to be made at about one line, and some even at the minute distance of 1-16th of an inch (*Hey*) from the union of the cornea with the sclerotic; but, as the ciliary processes ought invariably to be avoided, and there is no real cause to dread wounding the aponeurosis of the abductor muscle, as some have conceived, the propriety of puncturing the globe of the eye, at the distance of two lines, or two and a half, from the margin of the cornea, as advised by Petit, Platner, Bertrandi, &c. must, in all cases, be sufficiently manifest.

Nor is it a matter of indifference, at what height the needle is introduced, if it be desirable to avoid, as much as possible, effusion of blood in the operation. Anatomy reveals to us, that the long ciliary artery pursues its course to the iris, along the middle of the external convexity of the eyeball, between the sclerotic and choroid coats; and hence, in order to avoid this vessel, it is prudent to introduce the instrument about one line below the transverse diameter of the pupil, as Dudell, Guntz, Bertrandi, Scarpa, &c. have directed. If the couching needle were introduced higher than the track of the long ciliary artery, it would be inconvenient for the depression of the cataract.

The exact place, where the point of the needle should next be guided, is, no doubt, between the cataract and ciliary processes, in front of the opaque lens, and its capsule: but, as I conceive, the attempt to hit this delicate invisible mark, borders upon impossibility, and, with a straight pointed needle, might even endanger the iris, I cannot refrain from ex-

pressing my dissent to the common method of passing a couching needle at once in front of the cataract. On the contrary, it seems safer to direct the extremity of the instrument immediately over the opaque lens, and, in the first instance, to depress it a little downward, by means of the convex flat surface of the end of the needle, in order to make room for the safe conveyance of the instrument, between the cataract and corpus ciliare, in front of the diseased crystalline and its capsule; taking care, in this latter step of the operation, to keep the marked side of the handle forward, by which means the point of the needle will be in an opposite direction to the iris, and will come into contact with the diseased body, and the membrane binding it down in the fossula of the vitreous humour. Having done this (supposing it to be a firm cataract,) the instrument will be visible through the pupil; and now we are to push its point transversely, as near as possible the margin of the lens, on the side next the internal angle of the eye, taking strict care to keep it continually turned backward. The operator is then to incline the handle of the instrument towards himself, by which its point will be directed through the capsule, into the substance of the opaque lens; and, on making a movement of the needle, describing the segment of a circle, at the same instant inclining it downward and backward, he will lacerate the former, and convey it, in the generality of cases, with the latter, deeply into the vitreous humour.

It happened, unfortunately for the credit of the operation of depression, that M. Petit admonished surgeons to beware of wounding the anterior layer of the crystalline capsule: he had an idea, that, in observing this caution, the vitreous humour would afterwards fill up the space, previously occupied by the lens, and that thus the refracting powers of the eye might become as strong as in the natural state, and the necessity for using spectacles might thereby be considerably obviated. But, we are now apprized, that leaving this very membrane, from which M. Petit anticipated such great utility, even were it practicable to leave it constantly uninjured in its natural situation, would be one of the worst inculcations that could possibly be promulgated; for, in many cases, where extraction proves fruitless, in some, where depression fails, the want of success is owing to a subsequent opacity of the crystalline capsule; in short, blindness is reproduced by the secondary membranous cataract. It seems more than probable, that in some of the instances,

where the opaque lens has been said to have risen again, nothing more has happened, than the disease in question. Therefore, notwithstanding the whole capsule may be, in the majority of cases, depressed with the lens out of the axis of vision, as it is not a constant occurrence, I cannot too strongly enforce the propriety of extirpating, as it were, every source and seat of the cataract in the same operation, and, in imitation of the celebrated Scarpa, the only one who, as far as my information reaches, has put sufficient stress upon this practice, I shall presume to recommend, as a general rule in couching, always to lacerate the front layer of the capsule, whether in an opaque or transparent state.

The capsule of the crystalline lens may retain its usual transparency, while the lens itself is in an opaque state. In this case, an inexperienced operator might, from the blackness of the pupil, suppose, not only that he had removed the lens, but also the capsule from the axis of sight; and, having depressed the cataract, he might unintentionally leave this membrane entire in its natural situation. Therefore, if there should be any reason for suspecting, that the anterior layer of the capsule has escaped laceration; if, in other words, the resistance made to moving the convexity of the instrument forward, towards the pupil, should give rise to such a suspicion; for the sake of removing all doubt, it is proper to communicate to the needle a gentle rotatory motion, by which its point will be turned forward, and disengaged, through the transparent capsule, opposite the pupil: then, by repeating a few movements downward and backward, it will be so freely rent with the needle, as to occasion no future trouble.

FLUID, OR MILKY CATARACT.

When the case is of this description, the operator frequently finds, that, on passing the point of the couching needle through the anterior layer of the capsule, its white milky contents instantly flow out, and, spreading like a cloud over the two chambers of the aqueous humour, completely conceal the pupil, the iris, and the instrument, from his view; who, however, ought never to be discouraged at this event. In the *Critical Reflections on the Cataract*, I have dissented from continuing the operation, when, in its commencement, blood is effused into the aqueous humour; I have there adverted to the effusion of the milky matter of cataracts, into the same situation; and, I have said, that the two cases are not to

be considered in a different light ; but, I only alluded to the consequences of these occurrences. I shall now take the opportunity to observe, that, although it seems to me most prudent, to postpone the completion of the operation, in the example of blood concealing the pupil, in the first step of couching, and not to renew it, before the aqueous humour has recovered its transparency ; yet, I am inclined to adopt this sentiment, chiefly because the species of cataract is, in this circumstance, quite unknown to the operator, consequently he must be absolutely incapable of employing that method of couching, which the peculiarities of the case may demand. It is very different, when a milky fluid blends itself with the aqueous humour, and prevents the surgeon from seeing the iris and pupil ; this event is itself a source of information to him, inasmuch as it gives him a perfect insight into the nature of the cataract, which he is treating ; and instructs him what method of operating it is his duty to adopt. The surgeon, guided by his anatomical knowledge of the eye, should make the curved point of the needle describe the segment of a circle, from the inner, toward the outer canthus, and in a direction backward, as if he had to depress a firm cataract. (*Scarpa*.) Thus he will succeed in lacerating, as much as is necessary, the anterior layer of the capsule, upon which, in a great measure, the perfect success of the operation depends ; and, not only in the milky, but almost every other species of cataract.

In regard to the extravasation of the milky fluid, into the two chambers of the aqueous humour, numerous observations, from the most creditable authorities, prove, that it spontaneously disappears, very soon after the operation, and leaves the pupil of its accustomed transparency. "In twelve cases of a dissolved lens, on which I have operated," says Latta, "the dissolution was so complete, that, on entering the needle into the capsule of the lens, the whole was mixed with the aqueous humour, and all that could be done, was to destroy the capsule as completely as possible, that all the milky matter might be evacuated. In ten of these cases, vision was almost completely restored in four weeks from the operation." Mr. Pott, in treating of this circumstance, viz. the effusion of the fluid contents of the capsule into the aqueous humour, observes, that so far from being an unlucky one, and preventive of success, it proves on the contrary, productive of all the benefit which can be derived from the most successful depression

or extraction, as he has often and often seen. But as this point is, I believe, no longer made an objection to couching, it would be superfluous to enlarge, in confirmation of what has been stated concerning it.

SOFT, OR CASEOUS CATARACT.

When the cataract is of a soft, or caseous description, the particles of which it is composed, will frequently elude all efforts made with the needle to depress them, and will continue behind the pupil in the axis of vision. This has been adduced as one instance that baffles the efficacy of couching, and may really seem, to the inexperienced, an unfortunate circumstance. It often happens that, in the operation of extraction, fragments of opaque matter are unavoidably overlooked and left behind ; yet Richter, who once so strenuously signalled himself in favour of the new operation, confesses, that such matter is removed by the absorbents. Supposing a caseous cataract should not have been sufficiently broken, and disturbed in the first operation, and that, consequently, the absorbents do not completely remove it, such a state may possibly require a re-application of the instrument ; but this does not generally occur, and is the worst that can happen. It is quite impossible to determine *a priori*, what effect will result from the most trivial disturbance of a cataract ; its entire absorption may, in some instances, follow, while in others, a repetition of an operation becomes necessary for the restoration of sight. Even where the whole firm lens has re-ascended behind the pupil, as Latta and Hey confirm, the absorbents have superceded the necessity for couching again. The disappearance of the opaque particles of cataracts was, in all times, and in all ages, a fact of such conspicuity, that, as appears from the authorities already quoted, it was recorded, even previous to the discovery of the system of lymphatic vessels in the body. Indeed the modern observations of Scarpa, and others, so strongly corroborate the account which I have given, of the vigorous action of the absorbents, in the two chambers of the aqueous humour ; and, particularly, in the anterior one, that, from the moment the case is discovered to be a soft, or caseous cataract, it seems quite unnecessary to make any further attempt to depress it into the vitreous humour. Mr. Pott sometimes, in this circumstance, made no attempt of this kind, but contented himself with a free laceration of the capsule, and after turning the needle

round and round, between the finger and thumb, within the body of the crystalline, left all the parts in their natural situation, where he hardly ever knew them fail of dissolving so entirely, as not to leave the smallest vestige of a cataract. This eminent surgeon even practised occasionally what Scarpa so strongly inculcates at this day; he even pushed the firm part of such cataracts through the pupil into the anterior chamber, where it always disappeared, without producing the least inconvenience: we must, at the same time add, that he thought this method wrong, not on account of its inefficacy, but an apprehension that it would be apt to produce an irregularity of the pupil, one of the worst inconveniences attending the operation of extraction. But the deformity of the pupil, after extraction, seems to proceed either from an actual laceration of the iris, or a forcible distention of the pupil, by the passage of large cataracts through it, a kind of cause that would not be present in pushing the broken portions of a caseous lens into the anterior chamber; therefore, it does not seem warrantable to reject this very efficacious plan of treatment, for which the curved pointed needle is, undoubtedly, the best calculated. It is very deserving of notice, that Mr. Hey, who has several times seen the whole opaque nucleus and very frequently small opaque portions fall into the anterior chamber, makes this remark: "Indeed, if the cataract could, in all cases, be brought into the anterior chamber of the eye, without injury to the iris, *it would be the best method of performing the operation.*" What the same author also observes in the subsequent part of his work, is strikingly corroborative of the efficacy of Scarpa's practice. The practice of the Italian professor consists in lacerating the anterior portion of the crystalline capsule, to the extent of the diameter of the pupil, in a moderately dilated state; in breaking the pappy substance of the diseased lens piecemeal; and in pushing the fragments through the pupil, into the anterior chamber, where they are gradually absorbed.

MEMBRANOUS CATARACT.

One great advantage in favour of couching, depends upon its generally removing the capsule, at the same time with the lens, from the passage of the rays of light to the retina. Sometimes, however, this desirable event, by which the patient is extricated from the danger of a secondary membranous cataract, does not take place even in the operation of depression; and,

when the lens included in its capsule is extracted from the eye, by the other method, it may always be considered as rather an uncommon circumstance. What most frequently constitutes the secondary membranous cataract, is the anterior half of the capsule, which not having been removed, or sufficiently broken, in a previous operation, continues more or less entire in its natural situation, afterwards becomes opaque, and thus impedes the free transmission of the rays of light in the seat of vision. Sometimes the secondary membranous cataract presents itself beyond the pupil, in the form of membranous flakes, apparently floating in the aqueous humour, and shutting up the pupil: at other times it appears in the form of triangular membranes, with their bases affixed to the *Membrana Hyaloidea*, and their points directed towards the centre of the pupil. When there is only a minute membranous flake suspended in the posterior chamber, it is on no account necessary for the patient to submit to another operation; vision is tolerably perfect, and the small particle of opaque matter will, in time, spontaneously disappear. But when the secondary membranous cataract consists of a collection of opaque fragments of the capsule, accumulated so as either in a great degree or entirely to close the pupil; or when the disease consists of the whole anterior half of the opaque capsule, neglected in a prior operation, and continuing adherent in its natural situation, it is indispensable to repeat an operation; for, although in the first case, there may be good reason to hope that the collection of membranous fragments might, in time, disappear, yet it would be unjustifiable to detain the patient for weeks and months in a state of anxiety and blindness, when a safe and simple operation would restore him, in a very short space of time, to the enjoyment of this most useful of the senses. In the second case, it is absolutely indispensable: for while the capsule remains adherent to its natural connections, the opacity seldom disappears, and may even expand itself over a larger portion of the pupil. The operation should be performed as follows: when the aperture in the iris is obstructed by a connection of membranous flakes, detached from the *membrana hyaloidea*, the curved needle should be introduced, with the usual precaution of keeping its convexity forward, its point backward, until arrived behind the mass of opaque matter; the surgeon is then to turn the point of the needle towards the pupil, and is to push through this opening, regularly one after another, all the

opaque particles into the anterior chamber, where, as we have before noticed, absorption seems to be carried on more vigorously than behind the pupil. All endeavours to depress them into the vitreous humour, Scarpa has found to be vain; for scarcely is the couching needle withdrawn when they all re-appear at the pupil, as if, (to use his own phrase) carried thither by a current: but when forced into the anterior chamber, besides being incapable of blocking up the pupil, they lie, without inconvenience, at the bottom of that cavity, and in a few weeks are entirely absorbed.

When the secondary membranous cataract consists of the whole anterior layer of the crystalline capsule, or of several portions of it connected with the membrana hyaloidea, the surgeon, after cautiously turning the point of the needle towards the pupil, is to pierce the opaque capsule; or, should there be any interspace, he is to pass the point of the instrument through it; then, having turned it again backward, he is to convey it, as near as possible, to the attachment of the membranous cataract, and after piercing the capsule, or each portion of it successively, and sometimes carefully rolling the handle of the instrument between his finger and thumb, so as to twist the capsule round its extremity, he will thus break the cataract, as far as it is practicable, at every point of its circumference. The portions of membrane, by this means separated from their adhesions, are next to be cautiously pushed, with the point of the couching needle turned forward, through the pupil, into the anterior chamber. In these manœuvres the operator must use the utmost caution not to injure the iris, and ciliary processes, for, upon this circumstance depends having no bad symptoms after the operation, notwithstanding its duration may have been long, and the necessary movements of the needle numerous reiterated. If a part of the membranous cataract should be found adherent to the iris, (a complication, that will be indicated when, upon moving it backward or downward with the needle, the pupil alters its shape, and, from being circular becomes of an oval, or irregular figure,) even more caution is required than in the foregoing case, so as to make repeated, but delicate movements of the needle, to separate the membranous opacity, without injuring the iris.

Nor will it be necessary to vary the plan of operating already explained, if occasionally the cataract should be formed of the posterior layer of the capsule.

The same plan also succeeds in those

rare instances where the substance itself of the crystalline wastes, and is almost completely absorbed, leaving the capsule opaque, and including, at most, only a small nucleus, not larger than a pin's head. Scarpa terms it the *Primary Membranous Cataract*; he describes it as being met with in children, or young people under the age of twenty; as being characterized by a certain transparency, and similitude to a cobweb; by a whitish opaque point, either at its centre or circumference; and, by a streaked and reticulated appearance: he adds, that whosoever attempts to depress such a cataract is baffled, as it re-appears behind the pupil soon after the operation; he recommends breaking it freely with the curved extremity of the couching needle, and pushing its fragments into the anterior chamber, where they are gradually absorbed in the course of about three weeks.

No other topical application is generally requisite, after the operation, than a small compress of fine linen; the patient ought to be kept in a quiet, dark room, and in bed. A dose of some mild purgative salt, such as the natron vitriolatum; magnesia vitriolata; soda phosphorata, &c. may usually be administered, with advantage, on the following morning. I shall not enlarge upon the method of treatment, when the inflammation, subsequent to couching, exceeds the ordinary bounds; in hypochondriacal, hysterical, and irritable constitutions, this is more frequently met with, and I have already touched upon the propriety of some preparatory measures, before couching these unfavourable subjects.

I cannot help remarking how judicious it is never to attempt too much at one time of couching. It happens in this, as in most other branches of operative surgery, that celerity is too often mistaken for skill: the operator should not only be slow and deliberate in achieving his purpose; he should be taught to consider, that a repetition of couching may, like the puncture of a vein, be safely and advantageously put into practice again and again; and with far greater security than if, for the sake of appearing expeditious, or avoiding the temporary semblance of failure, a bolder use of the couching needle should be made, than the delicate structure of the eye warrants. We read, in Mr. Hey's *Practical Observations on Surgery*, that he couched one eye seven times, before perfect success was obtained; had he been less heedful, and endeavoured to effect by one or two rough applications of the instrument, what he achieved by seven efforts of a gentler description, it is highly

probable that the structure of the eye would have been so impaired, as well as the consequent ophthalmia so violent, as to have utterly prevented the restoration of sight.

OF THE CONGENITAL CATARACT, AND OPERATING UPON CHILDREN.

So much has been already said in a preceding section of this article, concerning the propriety and striking advantages of operating for the cataracts of children, that, to expatiate further upon this point, would be a mere waste of time.

We have noticed the case, which Scarpa terms the *primary membranous cataract*, and which is mentioned by that distinguished professor, as being met with in children, or young people, under the age of twenty, the substance of the crystalline itself being almost entirely absorbed, while the capsule is left in an opaque state, including, at most, only a small nucleus, not larger than a pin's head. This disease is described by Scarpa as being exceedingly rare, and characterised by a certain transparency, and similitude to a cobweb; by a whitish opaque point, either at its centre, or circumference; and by a streaked and reticulated appearance. Now, this example, which is represented by Scarpa, as being rare, appears, from the experience of Mr. Saunders, to be by no means uncommon, since, at the London Infirmary for curing diseases of the eye, it has been found that the majority of congenital cataracts were capsular, or membranous. This last statement is also at variance with that of the late Mr. Gibson, who has asserted, that, in infants, the cataract is generally fluid. (*Edinburgh Medical and Surgical Journal*, Vol. 7, p. 397.) Mr. Ware

also asserts, that, in children, born with cataracts, the crystalline humour has generally, if not always, been found either in a soft, or fluid state. (*Observ. on the Cataract and Gutta Serena*, Vol. 2, p. 380.) However, as Mr. Saunders must have had the most experience in these particular cases, I believe, we must consider his account as the most accurate. We learn from this last gentleman's publication, that, in the congenital cataract, after the crystalline lens is converted into an opaque substance, it is gradually absorbed; and, in proportion to the progress of absorption, the anterior lamella of the capsule approaches the posterior, until they form one membrane, which is white, opaque, and very elastic. This process is commonly completed long before the eighth year, and the operator will now find a substance, which he will in vain endeavour either to extract, or depress. But, there is one form of the congenital cataract, in which the absorption of the lens does not proceed, viz. when the centre of the crystalline is opaque, and its circumference is perfectly transparent. Should the capsule and lens be penetrated, however, with any instrument, the opacity soon becomes complete, and from this moment, the substance of the lens begins to be absorbed.

The experience of Mr. Saunders proves, that, in the congenital cataract, the lens may be either solid, soft, or fluid, but, that more frequently it is partially, or completely absorbed, and the cataract is capsular.

The following table of forty-four cases is given in Mr. Saunders' work, for the purpose of shewing in what proportion, each species of cataract has been found to prevail in congenital cases.

Solid opaque lens, with or without opacity of the capsule. Three single, two double cataracts	} 5
Solid lens, opaque in the centre, transparent in the circumference, with capsule in the same state. Five double	} 5
Soft opaque lens, with, or without opacity of the capsule. Two single, two double	} 4
Soft opaque lens, with solid nucleus. One single, two double	3
Soft opaque lens, with dotted capsule, the spots white, the spaces transparent. Two double	} 2
Fluid cataract, with opacity of the capsule. Two single	2
Fluid cataract, with opacity of the capsule, and closed pupil. Two double	} 2
Opaque and thickened capsule, the lens being completely absorbed, or the remains of it being thin and squamose. Six single, twelve double	} 18

Opaque and thickened capsule, with only a very small nucleus of the } 2
lens unabsorbed in the centre. Two single

Opaque and thickened capsule in the centre, remains of the lens in } 1
the circumference. One double

Here the corresponding character of congenital cataracts in the eyes of each individual is exhibited by the number of double cases, and, we are informed, that the same character was preserved in the cataracts of several children of the same family. (*Saunders on Diseases of the Eye, Edit. by Dr. Farre, p. 135, 136.*)

The congenital cataract appears frequently to afflict several children of the same parents. In the course of the present article, I have already had occasion to advert to two striking examples of this fact. The first is related by Mr. Lucas, who attended five children of a clergyman at Leaven, near Beverly, all born with cataracts. (See *Med. Obs. and Inquiries, Vol. 6.*) The second is mentioned by Mr. Gibson, who, some years ago, saw five, or six children, the families of two sisters, who were all totally blind, and in an idiotic state, having cataracts accompanied with amaurosis. (*Edinb. Med. and Surgical Journal, Vol. 8, p. 398.*) Several instances occurred to the late Mr. Saunders. In one family, two brothers were thus afflicted. In a second family, two brothers, twins, became blind with cataracts at the age of twenty-one months, each within a few days of the other. It is remarkable, that the four cataracts had precisely the same character. In a third family, a brother and two sisters were born with this disease. The eldest sister was affected with it only in one eye, the brother and youngest sister in both eyes. In a fourth family, three brothers and a sister had all congenital cataracts. (*Saunders on the Diseases of the Eye, p. 134, 135.*)

Children with congenital cataracts possess various degrees of vision; but, when they are totally blind, their eyes not being attracted by external objects, volition is not exercised over the muscles of these organs, which roll about with an irregular, rapid, and trembling motion.

I shall now proceed to speak of the manner of operating upon children. Until the time of Mr. Pott, the intention of surgeons, in couching, or depressing the cataract, (as indeed the expression itself implies) was to push the opaque crystalline downward, away from the pupil. Mr. Pott, conscious that the cataract often existed in a fluid, or soft state, was aware that it could not then be depressed; and, therefore, in such cases, he recommended using the couching needle for the express purpose of break-

ing down the cataract, and of making a large aperture in the capsule, so that the aqueous humour, which he believed to be a solvent for the opaque crystalline, might come into immediate contact with this body. This operation, since the time of Mr. Pott, has been strongly and ably recommended by Mr. Hey, of Leeds, and Professor Scarpa, of Pavia. In the cases of children, it has even received the approbation of Mr. Ware, who informs us that he and his son have performed a similar operation on a considerable number of infants and young persons with uniform success. (*On the Operation of Puncturing the Capsule of the Crystalline Humour, p. 9.*)

But, notwithstanding the utility and efficacy of lacerating the front layer of the crystalline capsule had been so much insisted upon by Scarpa and others, their observations were confined to the cataract in the adult subject, and, before the example set by the late Mr. Saunders, no one, (excepting, perhaps, Mr. Gibson of Manchester) ventured to apply, as a regular and successful practice, such an operation to the eyes of infants and children. Indeed, it seems highly probable, that even Mr. Gibson himself would have remained silent upon the subject, had not his attention been roused by the reports of the London Institution for curing diseases of the eye, which reports, he says, were dispersed and exhibited in the public newsrooms of Manchester. For the creation and perfection of this beneficial practice, therefore, I am disposed to give the memory of Mr. Saunders great honour. The propriety of operating for the cataracts of children had long ago been insisted upon by a few writers, and the attempt even now and then made; but, the method never gained any ground, until Mr. Saunders led the way.

It only remains for me to describe the plans of operating, executed by Mr. Saunders, Mr. Gibson, and Mr. Ware.

The principle, on which Mr. Saunders proceeded in his operations on the congenital cataract, is founded on the opinion, that the only obstacle to the absorption of the opaque lens is the capsule; and that as the latter also is most generally opaque, "the business of art is to effect a permanent aperture in the centre of this membrane. This applies to every case of congenital cataract, which can occur." Mr. Saunders used to over-

come the difficulty of operating upon children, by fixing the eye ball with Pel-lier's elevator, having the patient held by four or five assistants, dilating the pupil with the belladonna, and employing a very slender needle, armed with a cutting edge from its shoulders to its point, and furnished with a very sharp point, calculated to penetrate with the utmost facility.

Before the operation, the extract of belladonna, diluted with water to the consistence of cream, was dropped into the eye, or, to avoid irritation, the extract itself was smeared in considerable quantity, over the eyelid and brow. In less than an hour, if there be no adhesions, it produces a full dilatation of the pupil, exposing to view nearly the whole anterior surface of the cataract. The application should then be washed from the appendages of the eye.

In using the needle, Mr. Saunders, most carefully abstained from doing any injury to the vitreous humour, or its capsule, and it was an essential point with him to avoid displacing the lens. In directing the extremity of the instrument to the centre of the capsule, he passed it either through the cornea, near the edge of this membrane, or through the sclerotica, a little way behind the iris. By the first, which is called the *anterior* operation, Mr. Saunders conceived, that less injury would be inflicted, and less irritation excited, than by introducing the needle behind the iris, through all the tunics of the eye. In every case, the first thing aimed at was the permanent destruction of the central portion of the capsule to an extent equal to that of the natural size of the pupil. If the capsule contained an opaque lens, Mr. Saunders used next to sink the needle gently into the body of the crystalline, and moderately open its texture; cautiously observing not to move the lens at all out of its natural situation.

When the case was a fluid cataract, Mr. Saunders was content in the first operation with simply lacerating the centre of the capsule, being desirous of avoiding to increase the irritation following the diffusion of the matter of cataract in the aqueous humour.

When the cataract was entirely capsular, Mr. Saunders acted with rather more freedom, as he entertained in this case less fear of inflammation; but, in other respects, he proceeded with the same objects in view, which have been already related, and of which the principal consisted in effecting a permanent aperture in the centre of the capsule, without detaching this membrane at its

circumference; for then the pupil would have been more or less covered by it, and the operation imperfect, "because this thickened capsule is never absorbed, and the pendulous flap is incapable of presenting a sufficient resistance to the needle to admit of being removed by a second operation." (P. 145.)

I have already explained, that Mr. Saunders found, that the greatest success attended the operation between the ages of eighteen months and four years. One operation frequently accomplished a cure; as many as five were seldom requisite.

The only particularity, in Mr. Saunders' treatment of the eye after the operation, was that of applying the belladonna externally, for the purpose of making the pupil remain dilated, till the inflammation had ceased, so as to keep the edge of the iris from contracting adhesions with the margin of the torn capsule. In leaving this part of the subject, I must advise every surgeon to read the interesting account of Mr. Saunders' practice, published by his friend and colleague, Dr. Farre. Many minute particulars will be found in this work, highly worthy of the practitioner's attention and imitation.

Mr. Gibson appears to have been unacquainted with the usefulness of the extract of belladonna in preparing the eye for the operation. A few hours before operating, he was in the habit of ordering an opiate, sufficient to produce a considerable degree of drowsiness, so that the infant generally allowed its eyelids to be opened, and properly secured without resistance, and was little inclined to offer any impediment to the introduction of the couching needle; but, on the contrary, presented the sclerotica to view, naturally turning up the white of its eye. If the infant was more than a year old, and whenever it was necessary, Mr. Gibson used to introduce its body and arms into a kind of sack, open at both ends, and furnished with strings to draw round the neck, and tie sufficiently tight round the legs, so that its hands are effectually secured, and the assistants have only to steady its body, and fix its head, whilst the child is laid on a table, upon a pillow. Mr. Gibson never found it necessary to use a speculum, having uniformly experienced, that, after the couching needle was introduced, he had no difficulty in commanding the eye, aided by a slight degree of pressure upon the eyeball with the index and middle fingers of his left hand, which were employed in depressing the lower eyelid. He admits, however, that the speculum can easily be applied, if an operator prefer it. He generally used Scarpa's needle, because, in

infants, the free rupture of the capsule of the lens ought commonly to be aimed at, in order that the milky cataract may escape, and mix with the aqueous humour; or, if the cataract be soft, that the aqueous humour may be freely admitted to its pulpy substance, which has been previously broken down with the needle. He thinks, that no peculiarity is necessary in depressing the hard cataract of infants. Before Scarpa's needle was known in this country, Mr. Gibson used Mr. Hey's, which was generally effectual, and, as he conceives, possesses the recommendation of being less liable to have its point entangled in the iris. He says, that, when a milky cataract has been thus evacuated, it renders the aqueous humour turbid; but, that, within the space of two days, the eye generally acquires its natural transparency, and vision commences. When the capsule and substance of the soft cataract have been broken down, and the aqueous humour has come into contact with the lens, the solution and disappearance of the cataract, in all the cases, upon which Mr. Gibson has operated, have uniformly taken place, in a short time. The experience of Mr. Gibson curiously differs from that of Mr. Saunders in one respect: he assures us, that although he has met with cataracts in infants hard enough to bear depression, yet, that *he has never met with a simple membranous cataract*; though this is no uncommon occurrence in patients at the age of eight, or ten, as well as in adults, who have been blind from birth. (See *Edinburgh Med. and Surgical Journal*, Vol. 8, p. 398, 399.)

For the purpose of fixing the eye, Mr. Ware thinks Pellier's elevator requisite in operating upon infants. When the patient, however, has advanced beyond the age of infancy, Mr. Ware sometimes fixes the eye by means of the fingers alone. For the purpose of puncturing the capsule, and breaking down the cataract, this gentleman gives the preference to an instrument, which resembles one, that was recommended by Cheselden for the purpose of making an artificial pupil; but, it is somewhat narrower. Its blade indeed is so narrow, that it nearly resembles a needle. Its extremity is pointed, and it cuts on one side for the space of about the eighth of an inch, the other side being blunt. It is perfectly straight; is an inch long in the blade; and forms a complete wedge through its whole length. Upon one side of the handle is a coloured spot, by attending to which, the operator may always ascertain the position of the instrument in the eye.

Mr. Ware dilates the pupil with the ex-

tractum belladonna, softened with a little water, and applied about half an hour before the time of operating. This gentleman thinks, that, in operating upon infants, the surgeon will perform the operation with more composure, if the patient be laid upon a table, with the head properly raised on a pillow. The bent end of Pellier's elevator should be introduced under the upper eyelid, and the instrument committed to the care of an assistant. If the right eye is to undergo the operation, and the surgeon operate with his right hand, he must of course sit or stand behind the patient; and, in this case, he will himself manage the speculum with his left hand. The eye being thus fixed, Mr. Ware passes the point of the narrow bladed knife above mentioned through the sclerotica, on the side next to the temple, about the eighth of an inch from the union of that membrane to the cornea, the blunt edge being turned downwards. The instrument is pushed forwards in the same direction, until its point nearly reaches the centre of the crystalline. The point should then be brought forwards, until it has passed through the opaque crystalline and its capsule, and is plainly visible in the anterior chamber of the aqueous humour. If the cataract be fluid, and the anterior chamber become immediately filled with the opaque matter, Mr. Ware thinks it advisable to withdraw the instrument, and defer further measures until the matter is absorbed, which absorption usually takes place in the course of a few days, and sometimes of a few hours. If no visible change be produced in the pupil, the point and cutting edge of the instrument should be applied in different directions, so as to divide both the opaque crystalline and its capsule into small portions, and, if possible, to bring them forwards into the anterior chamber. This may require the instrument to be kept in the eye for a minute or two; but, if the operator preserve his steadiness, he may continue it there a much longer time without doing the least injury to the iris or to any other part. If the cataract be found of a firm consistence, (though this rarely happens in young persons,) it may be advisable to depress it below the pupil; and in such a case particular care should be taken to perforate largely the posterior part of the capsule, and to withdraw the instrument immediately after the cataract has been depressed, in order to hinder it from rising again. If the opacity be in the capsule, the instrument will not act so easily upon it as it does on the opaque crystalline; but, notwithstanding this, the capsule as well as the crystalline, may be divided by

it into larger or smaller portions, which, when thus divided, will be softened by the action of the aqueous humour; and though in the first operation on such case, says Mr. Ware, it may not be possible to remove the opacity, yet, on the second or third attempt, the divided portions may be brought forwards into the anterior chamber of the aqueous humour, in which place, they will then be gradually absorbed, and will soon disappear. After the operation, Mr. Ware has seldom found it necessary to take away blood from children, or persons under the age of twenty. He continues a cooling antiphlogistic treatment a few days. After this, if any opaque matter remain, he expedites its absorption by dropping a small portion of powdered sugar into the eye once or twice a day. When, at the end of a week or ten days, the inflammation is over, and the pupil is obstructed with opaque matter, Mr. Ware advises a repetition of the operation. After a similar interval, the operation may be requisite again. Mr. Ware has, in most cases, been obliged to operate twice; in a few instances, once has been sufficient; and only in three, out of the last twenty, has he found it necessary to operate a fourth time. (*On the Operation of Puncturing the Capsule of the Crystalline Humour.*)

I think any impartial man, who considers the practice of the three preceding operators, will find great cause to admire the superior gentleness and skill, which predominate in the operations of the late Mr. Saunders. For my own part, I am so fully convinced of the mischief, which has been done to the eyes, by the rash boldness, awkwardness, and unsteadiness of numerous operators, that, it appears to me, the inculcation of gentleness and forbearance in all operations for the cataract, is the bounden duty of every man, who has occasion to write upon the subject. Great manual skill, and invariable gentleness, indeed, seem to me to have had more share in rendering Mr. Saunders' operations successful, than any particularity either in his method, or his instrument. I have no hesitation in declaring my own partiality to the principles, on which his practice was founded, and my belief, that they are well calculated to improve most materially this interesting branch of surgery.

SOME OBJECTIONS TO COUCHING CONSIDERED.

As it appears to me, that couching is a fitter operation for general practice, than the extraction of the cataract, and that several unfounded prejudices have been

set up against it, I shall conclude this article with a few reflections on this part of the subject.

Conceiving that baron Wenzel, who may be regarded as the chief modern champion of extraction, has had recourse to misrepresentation in the statement of his objections to couching, I shall beg the indulgence of a few minutes, to examine how far his observations coincide with those of other experienced men.

This author writes, (*On the Cataract*, p. 34.) that "the pain is severe during the operation." Scarpa, on the contrary, remarks, that the little pain experienced from it, and the consequent tranquillity of the patient's mind, may be one reason, why the ophthalmia is always milder after a repetition, than after the first time of couching. (*Saggio di Osservazioni, &c. Sulle Malattie degli Occhi*, p. 255, Venez., 1802.) How little foundation there is for this objection, must also appear from the patient's spontaneous acknowledgment. (*Hey's Pract. Obs. in Surgery*, p. 63) and from the voluntary promptitude, with which he generally submits to a repetition of the operation. Mr. James Lucas remarks, "that a cataract would very frequently be cured by one operation (alluding to depression,) but the pain from a repetition of it is so tolerable, that many wish it to expedite their cure." (*Med. Obs. and Inquiries*. Vol. 6, p. 256) Mr. Warner, in making mention of a case, observes, "I was in hopes, from this appearance, that the cataract might in time have subsided, &c. but, on account of the little pain the patient had suffered from these operations, he insisted upon a third;" and it was even repeated a fourth time, at the same person's instigation, before the cure was complete. (*Description of the human Eye, and its Diseases*, p. 88.) From the comparative experiments made by Poyet, Morand, and De la Faye, it would seem, that the pain of extraction and depression is about equal. (*Mém. de l'Acad. de Chirurgie*, Tom. 2, p. 572, 4to.)

Wenzel next objects, that "the vomiting, which frequently comes on at the distance of some hours after the operation, and the pain produced by the puncture of the retina and ciliary nerves, are apt to produce a collection of matter in the eye." (*On the Cataract*, p. 34, 35.) Mr. Hey has practised couching rather frequently for thirty-three years; he has also seen it frequently performed by his colleagues at the Leeds Infirmary, but has never yet seen an instance of suppuration in the eye after the operation. (*Pract. Obs. in Surgery*, p. 101, 102.) If suppuration should sometimes, in particular constitutions, follow the wound

inflicted in couching, and no doubt, it may occasionally ensue from this injury, it can furnish no argument against the operation, since it appears to be an uncommon circumstance, and extraction is not exempt from the same consequence. (*Mém. de l'Acad. de Chirurgie, Tom. 2, p. 581, 582, &c. 4to. Wenzel on the Cataract, p. 232, &c.*)

The baron also remarks, that "those, who have been couched, sometimes feel violent pains in the eye as long as they live;" (p. 35.) on the contrary, the experienced gentleman last cited, never knew this effect happen after the operation; besides, we cannot but notice, that Wenzel offers no authority for such an assertion but his own naked opinion. I am still not unaware, that Heister speaks of the torment formerly experienced by many after couching. (*Reflections annexed to his 5th Obs.*) and, if Wenzel should chance to make allusion to what this writer has stated, as a foundation for the objection in question, I believe, it cannot be fairly made to answer that purpose. Every novice in the subject before us, must often have read and heard, that a cataract which presents a good prospect of relief from any kind of operation, ought neither to have been preceded by, nor to be accompanied with pains in the eye and its vicinity: what particulars are detailed in Heister, by which it can satisfactorily be made out, that, in the examples alluded to, such pains did not precede the operation? and, as shooting pains in the eye do sometimes take place before, and independently of any operation, why may they not, in a few rare and solitary cases, happen after it from other distinct causes?

Wenzel also objects, that, "in introducing the couching needle, the blood-vessels of the choroides and retina are liable to be wounded, and the extravasated blood not only confuses the sight of the operator, but, unless speedily absorbed, is apt to produce a suppuration of the whole eye." (*Treatise on the Cataract, p. 35, 36.*) How little reason there is to apprehend the latter part of the objection, must be evident from what has been already delivered; that blood may possibly be effused into the aqueous humour, and obscure the iris and pupil, no one will deny; but, it is a well-known truth, that it is neither a frequent, nor, on account of the mere extravasation, a serious event. Wenzel is entirely mistaken in the source of the hemorrhage under consideration; it is impossible to conceive how blood, effused from the vessels of the choroides and retina, should rather find its way into the aqueous hu-

mour than out of the wound externally; at least during the operation, the period when it is alleged to happen; for the only track, through which it could then possibly insinuate itself into this fluid, is absolutely occupied and filled by the couching needle. As Richter more accurately represents, (*Anfangsgründe der Wundarzneikunst. 3. Band. p. 247. Göttingen, 1795.*) the blood extravasated from the choroides and retina is either voided externally, or, if that be impossible on account of the smallness of the wound, it probably finds its way into the vitreous humour; he confirms, that this sort of hemorrhage is seldom considerable; the blood is usually absorbed without further accident; and, when a round needle is employed, the extravasation rarely occurs at all. The fountain of that hemorrhage, to which Wenzel draws our regard, is totally different from what he would lead us to suppose; it is not in the vessels of the choroides or retina, but, undoubtedly, in those of the ciliary processes and iris. In this case, the inflammation and suppuration of the eye, were they to occur, would not be so much the effect of the extravasation, as of the unskilful and unnecessary injury of those important parts. Every one is aware, that, in couching milky cataracts, the white contents of the crystalline capsule are often suddenly blended with the aqueous humour, so as entirely to conceal the pupil: yet, so simple of accomplishment in this operation, that several modern surgeons (*Latta, Scarpa, &c.*) do not even postpone its completion on account of this event; they continue to lacerate the capsule, and the opaque fluid, extravasated into the two chambers of the aqueous humour, is very soon absorbed. Neither can the case be considered in a different light, in regard to consequences, when blood is effused into the same situation. By what is here stated, I would by no means have it interpreted, that my opinion coincides with those, who may judge proper to continue the operation in this last circumstance; far from it,—I am too strongly convinced of the propriety of the advice, inculcated by Messrs. Lucas and Hey, that a repetition of so mild an operation is always preferable to attempting too much at one time. "The principal cautions required in couching are, not to wound the iris and ciliary processes, and not to attempt too much at one operation." (*Med. Observations and Inquiries, Vol. 6, p. 256. Also Practical Observations in Surgery, p. 71, 72.*) I have myself seen a rapid effusion of blood take place beneath the cornea, on making the incision of this membrane to extract

the cataract; and it evidently proceeded from an injury of the iris.

Another futile objection is, "that the ciliary processes, which surround the crystalline, are liable to be wounded in the different movements of the needle." (*Wenzel on the Cataract*, p. 39.) In the performance of the operation, the needle may, undoubtedly, be used, so as to do considerable mischief; but then it must be from unskilfulness; ignorance of the anatomy of the eye; or from the bad construction of the instrument employed; and, as it is easy to achieve couching in the best style, it cannot justly be chargeable with ills deducible merely from its having been ill executed.

Wenzel asserts, "that an opacity of the posterior layer of the capsule of the crystalline lens takes place much oftener after depression than extraction. (*P. 24.*) Why he should fix upon the posterior part of the capsule I know not. In Mr. Ware's opinion, an opacity of the front portion is much more common. (*See note, p. 25. of Wenzel's Treatise, translated,*) and may now and then happen after the usual manner of couching; but, in the method (which I have explained) in imitation of the celebrated Scarpa, this kind of secondary membranous cataract will hardly ever follow the operation of depression. Callisen, who has enjoyed ample opportunities of estimating in his own experience the advantages and disadvantages, both of extracting and depressing the cataract, states, in his comparative conclusion in favour of the latter, "*A Depressione varius surgit Cataracta Secundaria, visus perfectior.*" *Vid. System. Chirurgie Hodiernæ. Partem. Poster. p. 637. Hafnia, 1800.* The reason, why the secondary membranous cataract so seldom happens after couching, depends on the circumstance of the capsule being commonly depressed into the vitreous humour at the same time with the opaque lens; a fact to which I shall have occasion to advert again. It is very certain, that, as the advocates of extraction acknowledge their process to be inadequate to remove with safety the species of cataract situated in the posterior layer of the crystalline capsule. (*Platen on the Cataract, p. 138. Ware, in a note, p. 264 of Wenzel's Treatise, and his Enquiry into the Causes preventing the Success of Extraction, &c. p. 40.*) and which, undeniably, does sometimes take place, it must be a principal object with them to impute the evil, whenever it does happen, to the effect of couching. (*"La Peyronie et Morand firent a l'Academie des Sciences des Cataractes vraisement membraneuses qui avoient leur siége*

dans la capsule Antre. et Postre. du Crystallin." *Pom. 3. p. 2. Sabatier.*)

The total closure of the pupil, alleged to happen rarely after extraction, more frequently after depression, suffice it to state, Mr. Hey has never seen, as a consequence of couching, in the course of his long and extensive experience. (*Practical Observations in Surgery, p. 109.*)

Here I shall introduce a short extract from Richter's Elements of Surgery, to shew how much this eminent surgeon has changed in favour of the old operation, in its present improved state.

"With respect to the defects and inconveniences, with which the operation of couching has been upbraided, it has been said; that the same only effects a palliative cure, as the cataract is merely depressed, and is always liable to re-ascend, and occasion a fresh blindness; that it can only be advantageously put into practice when the cataract is hard; not well when it is soft; and not at all when it is fluid; that it is difficult to ascertain with certainty before the operation the consistence of a cataract; that the result of this operation is also very uncertain; that, in doing it, all the coats of the eye are constantly pierced; that the body of the vitreous humour is always lacerated by the depressed lens; that the aponeurosis of the abductor muscle, the ligamentum ciliare, and nervi ciliares are frequently injured; and lastly, that the lens, at the time when it is depressed, may easily be forced (without the consciousness or least fault of the operator) against the choroidea and retina, so as to contuse, or even lacerate them.

"These various defects and inconveniences are (says Richter) partly, or entirely without foundation. Experience evinces, that the laceration of the vitreous humour by the cataract is unattended with any bad consequences; it appears from the preceding account, that every sort of cataract, both the soft and fluid, may easily and successfully be operated on with the needle; and that the lens, when it has been properly depressed, seldom or never re-ascends; that it often dissipates, and is quite absorbed in the vitreous humour, by which the patient is completely secured from any secondary blindness; and that, if the lens should happen to rise again, it may always be again easily depressed. Besides, it is much in favour of couching, that the capsule is, probably, in most cases, depressed with the lens, so that the patient continues in no danger of a secondary membranous cataract; that the eyesight afterwards is, as experience declares, commonly more

acute than after extraction; that the inflammation is less vehement, than in consequence of the other operation; that, upon the whole, it is much easier than it; and, lastly, that the two parts of the eye, upon the integrity of which sight afterwards principally depends, namely, the cornea and pupil, commonly suffer no injury." (*Anfangsgründe der Wundarzneykunst. Dritter Band. p. 359, 360.*)

Having thus been as brief as possible in attempting to shew the invalidity of some objections urged against couching, I might, perhaps usefully, devote a small portion of these pages to consider particularly the inconveniences of extraction; especially as the great exigency for this disquisition would fully acquit me of any spirit of retaliation. And, although it is, also, very certain, that the smooth side of this method has been solicitously held up to public view, while all its roughnesses and inequalities have been as industriously concealed; yet, since nothing but comparative experiments, instituted upon an extensive and impartial scale, can extricate various questionable points from their present mysterious state, and since men of my own age never command sufficient opportunities for this decisive undertaking, all that I can do is, to reflect a little on what others have made out; to exhort surgeons of large hospitals to put both operations to the test of comparison; and earnestly to invite them to give a faithful detail of the particulars and result to the public. To contrast two rival methods of practice is the only fair and infallible way of ascertaining the best.

On the continent, it appears, Callisen and Scarpa have, like our eminent Pott, built their reflections in favour of couching, not merely upon the firm ground of having themselves successfully and repeatedly practised it, but they have drawn their conclusions, after having with their own hands both extracted and depressed cataracts to that immense extent, which the office of surgeon to a large hospital permits; after having been eye-witnesses of the advantages and disadvantages of each method; and, after exemplifying in the theatres of surgery the comparative practice, upon which their observations and opinions were founded. *Omnibus tamen rite perpensis, tentaminumque ab idoneis chirurgis institutorum eventibus invicem comparatis, facile apparebit, depressionem in universum palman præcipere extractioni, quod quoque proprii nostra ac centenorum egrorum experientia, in quibus operationem cataractæ instituisse nobis contigit, confirmat. (Syst.*

Chirurg. Hodiernæ. Pars. Posterior, p. 637.) Such is the declaration of Callisen.

The Italian professor, after mentioning the advantages of couching; the facility of accomplishing it; its applicableness to every species of cataract; its producing subsequent symptoms far less severe and dangerous, than those which frequently happen after extraction; and, the power of successfully repeating it, when any incidental circumstance has rendered the primary attempts fruitless; observes, "*Mosso da queste verità di fatto, egli è da molto tempo che, posto a parte il metodo di curare la cataratta per estrazione, io mi sono appigliato onninamente alla pratica di quello per depressione, ed ho continui e grandi motivi d'esser contento della presa risoluzione.*" (*Saggio di osservazioni. &c. sulle principali Malattie degli occhi, p. 231. Venezia, 1802.*)

A fair comparison is the grand, and, indeed, the only standard of superior merit in any mode of practice; if it will not bear this test, then its exclusive adoption can only be attributed to the arbitrary influence of prejudice, a passion for novelty, or interested motives. Have they, who so deservedly have acquired fame and honour, for the inimitable skill, with which they surmount the difficulties of an arduous operation, have they, in their own experience, contrasted the two operations of extraction and depression? Have they proved to the world, that there is a case of cataract, remediable by the former, that is not so by the latter process? Have they satisfactorily demonstrated, that their method, backed, as it may be, with considerable adroitness, is more frequently efficacious and successful, than couching properly performed? Have they, in short, proved any thing more, than that they are men of surpassing dexterity, to which are assignable their evasion of the dangers of extraction, and their successful career in practice? Careful, as Baron Wenzel has been, to depict to the public only a series of prosperous cases, yet, the veil is not so dense, but that we may still discern through it many disastrous casualties, to which extraction is exposed: division of the iris; protrusion of the vitreous humour; separation of the iris at its outer margin from the choroid coats; prolapsus of the iris; irregularity of the pupil; irremediable opacity of the lower half of the cornea, &c.

That to couch is an easier thing, than to extract the cataract, all men of great experience in both ways universally agree, and, from the frequent failures in the very attempt to go through the latter

operation, no slight argument might be deduced against it; for if it be true, that want of skill ought to throw no discredit upon any operation whatsoever, it must, at least, be granted, that one so difficult as to baffle the ordinary dexterity of surgeons at large, and that is seldom well performed, except by a few professed oculists, has little to recommend it, even supposing it were, what it in fact is not, productive of superior efficacy and advantages. "*Depressio haud adeo difficilis est quam extractio, quæ consummatam dexteritatem, vix a multis chirurgis expectandam poscit, si nitide et omnimode ad regulas artis instituitur.*" (*Systema Chirurgiæ Hodiernæ. Pars posterior. p. 637.*) It is not a little remarkable, that Mr. Sharp should, at so early a period of the practice, as when he published his Critical Enquiry, have made the following observation:—"Now, after some trials, it seems rather to have fallen into disrepute, and I apprehend will be entirely discarded in favour of couching. To be candid, (he continues,) I perceive that the difficulty of performing the operation is too great to be universally practised." Neither is extraction, in any respect, more applicable to the various kinds of cataract, than depression, which is now found by men of the greatest experience. (*Cusson, Pott, Callisen, Lucas, Scarpa, Hey, Latta, &c. &c.*) by men, whose professional emolument, and reputation, have not depended upon the adoption of this, or any other individual operation; by practitioners of the most unbiassed opinions, and worthy of implicit confidence, to be adequate to the removal of every species of the cataract, whether in the substance, or the capsule of the crystalline lens; whether of a solid, or fluid consistence. But, besides being more easy of accomplishment, freer from accidental inconveniences, and, at least, equally efficacious, it possesses an unrivalled advantage over the opposite method in the practicability of its being successfully applied to infants and children, and repeated, when the first attempts prove inadequate to the perfect restoration of sight, a circumstance almost completely inadmissible after the first failure of extraction. It is true, Baron Wenzel relates two or three cases, where the operation was repeated with advantage, but, who will contend, that such reiterated sections of the cornea would not, in a great number of examples, destroy its transparent texture? But, why need I specify any particular cause of failure? It is enough to mention the result of experience. "*Depressio, si ex toto non successerit absque damno iterum*

iterumque repeti potest, inutilibus hæc tentaminibus haud impediendis, quo minus ad Extractionem demum cum successu recurrere queat; quod ipsi pluries comperimus; quum e contrario Extractio, si visum non reddat, omnem fere eum recuperandi spem excludat." (*System. Chirurg. Hodiernæ. Pars posterior. p. 637, 638.*) To Callisen's I shall add the authority of Scarpa upon this head. "*Perche a motivo di qualche incidente riuscendo alcuna volta infruttuosa la depressione, si può, senza correre alcun rischio, ripetere due e tre volte la stessa operazione sopra il medesimo occhio: la qual cosa non ha luogo ogni qual volta l'estrazione non ha avuto il desiato successo.*" (*Saggio di Osservazioni, &c. p. 231.*)

Difficult as extraction is upon a favourable eye, it becomes exceedingly more so when it is to be done on the right one; when the cornea is at all defective in point of convexity; when the anterior chamber of the aqueous humour is diminutive; when the muscles of the eye and eyelids are affected with spasms; when the cataract is large, and the pupil small and contracted; and, when the surface of the eye is more than ordinarily sunk in the orbit.

When the cornea is flat, the blade of the knife may easily pass between its layers, and not at all into the anterior chamber; if it should have passed deeply in this manner, an opacity of the cornea is to be apprehended. (*Richter's Anfangsgründe der Wundarzneikunst. 3 Band. p. 277.*) A gentleman, professedly in favour of extraction, has affirmed that, because the couching needle is always entered into the sclerótica, that is, farther back in the eye than the knife in extraction, it must be evident, that the elevated margin of the orbit is a greater impediment to couching than it can possibly be to extraction. (*Wathen on the Cataract, p. 111.*) This statement is, for the following reasons, inaccurate; the knife, in extraction, must absolutely be directed transversely through the anterior chamber; the safety of the iris prescribes this as an invariable rule; but, in couching, the surgeon may, if he chooses, (and Callisen directs this plan in every case) (*Systema Chirurg. Hodiernæ. Pars posterior, p. 616. Per omnia bulbi involucria in medium humorem vitreum, &c.*) introduce the needle in a direction towards the centre of the vitreous humour, by which the inconvenience, that would otherwise arise from the prominent margin of the orbit, may be completely eluded. In extraction, the difficulty would only be augmented by attempting to cut the cornea in any other direction than the common one; for, it is evident,

that the projection of the superciliary ridge of the os frontis above; of the nose internally; and the os malæ below; would create an additional source of embarrassment to any such attempt.

Wenzel proposed to pass the knife into the cornea, so that it should take a direction from above, downward and a little inward, and make its exit from the aqueous humour below, rather toward the inner angle of the eye, and cut, not the lower, but the external segment of the cornea; he proposed this with an idea of diminishing the hazard of an escape of the vitreous humour. Richter, in taking notice of the inutility of this plan, on account of the vitreous humour not being protruded merely by its gravity, but some other cause, observes, that it is attended with many difficulties; the prominent os frontis above absolutely hinders the knife from passing through the cornea in such a direction, as possibly to come out again below; should it even be conducted out, its point would certainly injure the lower eyelid, or cheek. In persons, whose eyelids are but little asunder, the knife can hardly be passed from above downward, without cutting both the upper and lower one; and how, continues this author, can the knife be directed from above downward, without being impeded by the fingers of the assistant who holds the upper eyelid? (*Anfangsgründe der Wundarzneykunst*, p. 266, 3 Band.) In fact, the common manner of cutting the cornea is the most practicable, and no variation in doing it will obviate the great inconvenience, arising from the prominent margin of the orbit in particular subjects.

The great difficulty in cutting the cornea with that accuracy, which the circumstances of extraction require, will ever form a great obstacle to the universal practice of this operation: when the edge of the knife is turned too much forward, the wound is made too small, and, in a situation, where the cicatrix may impede vision; when it is turned perpendicularly downward, or a little inward, the iris will inevitably be cut. In altering the edge of the knife either a little inward or outward, when it has once been introduced inaccurately into the anterior chamber, it is evident, that the form of the instrument can no longer correspond to the wound which it has previously made, and, consequently, the aqueous humour must be very liable to a premature escape. (*Richter's Anfangsgründe der Wundarzneykunst*, 3 Band. p. 279, 280.)

In making the incision of the cornea, it sometimes happens, that the pressure of the knife causes the eye to turn towards the inner angle, and, of course, the wound

in the cornea cannot, as long as the eye continues in this posture, be properly perfected. I have no hesitation in asserting, that no means of remedying this inconvenience have hitherto been, or are likely to be devised: to endeavour to bring in the aid of an instrument to fix the eye, when once the knife has pierced into the anterior chamber, must be particularly dangerous and unavailing. They, who have had most experience in the practice of this operation, acknowledge, that all contrivances to fix the eye are, by reason of the pressure which they occasion, extremely pernicious and dangerous; and how can the eye be turned outward again without withdrawing the knife? how can the knife be withdrawn without the aqueous humour escaping? how can the instrument be again introduced without injuring the iris? and, if the incision should be enlarged with scissors, what occasion will there be for any contrivance to prevent the eye from rolling toward the inner canthus, an effect that results from the transverse pressure of the knife? Richter confesses, that to make the eye revolve outward, by means of the knife itself, when introduced, requires a circumspect hand; indeed, it must be too hazardous to attempt, because should the knife be in the least retracted, the aqueous humour would instantly escape, and the iris would fall forward beneath its edge, so as almost inevitably to be cut; and, the moment the knife ceases to fill completely the wound that it has made, it must manifestly lose all power of moving the part, in which it is introduced. In this dilemma the preferable, though objectionable resource, is what Richter advises; to carry the knife perpendicularly downward, so as to cut about one-fourth of the circle of the cornea, and afterwards to enlarge the incision by scissors. The knife, when it has entered far into the anterior chamber, cannot be withdrawn without great hazard of injuring the iris, before it is completely out of the eye, and as soon as the aqueous humour begins to escape. But even to carry the knife directly downward, when you are in the dark with respect to the precise position of the cornea, cannot be free from risk; either of the aqueous humour escaping too prematurely over the back of the knife; or of the wound being made too high in the cornea, so that its cicatrix may afterwards obstruct vision, and its size be too diminutive for the easy passage of the cataract; or, lastly, of the wound being carried too much inward toward the iris, so as to injure it. The pressure necessary to extract large cataracts, when the incision in the cornea is not sufficiently ex-

tensive, is commonly the source of much mischief: violent inflammation, says Richter, and perpetual blindness are the inevitable consequences of forcible and long-continued pressure on the eyeball. The eye endures nothing so badly as strong pressure of this kind: he observes, when the wound is much too small, and one ventures to extract the lens through it by making considerable pressure, the vitreous humour starts forward, the pupil closes, and the patient remains for ever blind." (*Richter's Anfangsgründe der Wundarzneykunst*, p. 262, 263. 3 Band.) When we consider, that these observations come from one, who has had unlimited opportunities of observation; who once wrote so decidedly in favour of extraction; they claim the sincerest confidence.

In regard to the loss of the vitreous humour, unattended, as it undoubtedly has been, in certain instances, with any serious impairment of sight, it is justly considered as a cause very frequently preventing the success of extraction; nor can this objection be got rid of by referring the accident to want of skill in the operator. How human invention shall prevent its escape is difficult of conception, when we consider the nature of those causes, by which it is produced, and the variety of periods, at which it may happen; when we reflect, that it may take place even before the cataract itself is expelled, or immediately afterwards; that it may occur some hours, or some days after the operation; that unforeseen and uncontrollable spasm of the muscles of the eye; coughing, vomiting, sneezing, inadvertent friction, or pressure of the eye during sleep, fright, and other emotions of the mind, &c. may occasion it. If the evidence of experience unequivocally proves, and there is now no reason to doubt it, that a considerable, and even the greatest portion of the vitreous humour, has been protruded without the restoration of sight being prevented, we must refer the common fatality of the occurrence, not simply to the subsequent state of this humour, but to the effect, which its deficiency and sudden exit must have, in changing the condition of other more essential parts of the eye. Did the derangement of the vitreous humour itself, abstractedly considered, create the cause of failure, the effect would then follow as invariably as the accident takes place, which experience contradicts; and couching would, for the same reason, always prove an unsuccessful operation. I shall refer the ill effect, arising from the exit of the vitreous humour, to two other effects, which this event produces, and which operate as the immediate causes of failure. 1st. The

unnatural condition, into which the retina must fall when deprived of the support of the vitreous humour. This change must always take place to a considerable degree, when much of this humour is lost. In the singular case, related by Wenzel, (*On the Cataract*, p. 169) where three-fourths of the whole quantity of the vitreous humour was lost, and yet the success of the operation was not prevented, to what must we ascribe the good fortune? Was it that some accidental circumstances prevented the flow of the aqueous humour (which we know to be secreted very rapidly) through the incision of the cornea, and consequently, that it occupied the place of the vitreous humour very speedily, and thus afforded a timely degree of support to the retina? At all events, no inference can be drawn from so solitary an example, and the success must be attributed to some extraordinary circumstance. 2dly. The considerable injury, perhaps laceration, which the soft and delicate structure of the retina must frequently suffer, when the vitreous humour is suddenly protruded, offers one very rational explanation of the manner, in which the accident so often, and so seriously mutilates the eye.

I shall not dwell here upon wounds of the iris; no skill can regularly prevent their occurrence. No sooner does any instrument penetrate the eye, than the muscles of this organ usually contract in a spasmodic manner, so as to make great pressure upon the part, and to urge forward the cataract and the iris. In this circumstance, we cannot wonder, that the latter should, now and then, be injured by the edge of the instrument. Who can credit that, in the case of the iris being entangled against the edge of the knife, it can be so invariably disengaged without injury, as Wenzel describes, by gently touching the cornea with the finger? Richter justly observes, that this manœuvre is, also, not without risk of pressing out the aqueous humour; especially, if the irritation of touching the eye with the finger, should cause it to move; or, if the operator should, in the least, disturb the knife. (*Anfangsgründe der Wundarzneykunst*, 3 Band. p. 334, 335.)

It is unnecessary to enter into an argument against the slight importance, which Richter attaches to the escape of the vitreous humour, and wounds of the iris. They must ever be considered as the two chief dangers, to which extraction is exposed.

Much as they, who espouse the side of extraction, have dwelt on the eradica-
tive nature of that operation, it is an undeni-

able fact, that large fragments of soft cataracts frequently remain unobserved, at the time of operating, about the circumference of the capsule; a few days afterwards glide into the centre of the pupil, and continue to impede vision, until the same process takes place to remove them, which takes place in consequence of couching, and renders this latter operation, in reality, quite as productive of a radical cure as the former. It is also a well-known thing, that in extracting a cataract, the principal and almost sole aim of the operator, consists in endeavouring to extract an opaque lens from its capsule; no attempt is, or can safely be made to avert the occurrence of the secondary membranous cataract. This is the practice of Wenzel, Ware, and I believe of almost all the eminent patrons of extraction. Richter was well convinced, how uncertain this leaving of the capsule always rendered the result of the operation; he, therefore, directs its anterior layer to be broken, and pierced very freely with the instrument employed to make an opening into it; he also saw the advantage, that would proceed from extracting the capsule together with the lens; but, he likewise perceived the impediments to the accomplishment of so desirable an object. (*Anfangsgründe der Wundarzneikunst*, p. 350, &c. 3 Band.)

I am bold enough to presume, that the most fertile genius will never be able to suggest any means, that will serve to obviate the accumulated danger, when the cataract is large, the iris very irritable and contracted, consequently the pupil small; and how much real cause there is to fear, in this case, a sudden, but imperfect exit of the cataract, with protrusion of the vitreous humour, and such distension of the iris, as to create future irregularity of the pupil, it is superfluous to dwell upon. It is a more important reflection, inasmuch as soft cataracts, of various descriptions, are as frequently met with as firm ones, generally of large size, and the caseous kind, to which I particularly allude, not unfrequently even of twice the ordinary dimensions of a healthy lens. "Es ist nichts ungewöhnliches, dass der weiche Staar noch einmal so gross ist, als die gesunde Krystalline." (*Richter's Anfangsgr. der Wundarzn.* p. 178, 3 Band.)

I shall conclude this part of my observations with a passage from Richter's Elements of Surgery. "The principal advantages of extraction consist in its injuring none of the more sensible parts of the eye, only the insensible cornea, and in its radically curing the cataract, that is,

taking it entirely out of the eye. But it may, with reason, be objected; that the cure of the cataract by extraction, ought on no account, to be called radical, while the capsule, the seat of the possible, and not unfrequent secondary membranous cataract, remains behind in the eye; that far more important accidents are to be dreaded after extraction, than couching; opacity of the cornea; closure of the pupil; prolapsus of the vitreous humour and iris; and that extraction is much more difficult, and more subject to consequent inflammation, than depression." (*Anfangsgr. der Wundarzn.* p. 360, 361. 3 Band.)

This author, except at one place, (P. 316, 317) where he would induce one to believe, that the loss of part of the vitreous humour is rather advantageous, inasmuch as it renders the sight more acute afterwards, and the disposition to ophthalmia less, than when no such accident has happened, constantly enumerates it in the train of dangers, and takes great pains to inculcate how it is to be avoided. The inference to be drawn from this ambiguity is too conspicuous to require mentioning. (*Critical Reflections on the Cataract*, 1805.)

[Within a few years, many innovations have been attempted in the treatment of cataract; and from the success of several modern oculists, there is reason to anticipate much improvement, as the result of their experiments: at present, however, an exclusive preference of any one method, may be properly considered premature.

After Mr. Saunders' book appeared, (which, unfortunately for science, was a posthumous publication,) the operation of lacerating the capsule of the lens, which seldom failed in curing congenital cataract, was tried by surgeons in the cataracts of adults under various circumstances.

Mr. Adams, in 1812, published an essay containing many remarks on the subject; and in a more recent publication, in 1814, has enlarged these observations. Having noticed the rapidity with which the solution of the opaque lens takes place in the aqueous humour, Mr. Adams divides it with a small knife into several portions, and pushes these through the dilated pupil into the anterior chamber of the eye. The operations of Mr. Adams having been tried on an extensive scale at Greenwich hospital, the medical officers of that institution have published the result, and have compared it with that of their former practice. From their statement it appears that of *twenty-four* cases in which extraction had been performed, *one only had been completely successful*:

of the remaining twenty-three, twelve eyes were entirely destroyed; four, had obliterated pupils; three, gutta serena, and secondary cataract; and four, opaque cornea, and other diseased changes.

Mr. Adams operated on thirty-one cases, of which twenty-nine were perfectly cured, and one only failed; one patient having been dismissed for irregular conduct. The cases were nearly similar, in which the two operations were performed.

This is, indeed, a wonderful disparity of success. How much of it to ascribe to the superior professional skill of the operator, and how much exclusively to the new mode of operating, it is not for the editor to decide. He cannot, however, avoid remarking, that the twenty-four cases treated by extraction, afford the most disastrous specimen of surgery ever recorded, in regard to any operation. Were this a fair criterion of the general success of extraction, that operation had been long since laid aside. That it has been vastly more successful in other hands, the experience of Wenzel alone, is a sufficient proof. The writer of the present article has witnessed its performance in a great number of cases and in a large majority it has succeeded. After the statement made by the medical officers of Greenwich hospital, sanctioned by Mr. Adams, it is truly surprising to find this gentleman an advocate for extraction, in all cases of hard cataract. His words are, "where the cataract is too hard and solid to admit this immediate division, I do not attempt, (as was my former practice,) to effect its absorption by a frequent repetition of the operation; but I at once extract it."!!

Mr. Adams, (now Sir William) has invented a new mode of extraction, which he refuses to publish at present; but of which he says, he is "warranted in asserting, that it possesses the utmost degree of excellence which it is possible for extraction to arrive at; and that its general success will prove nearly as great as the operation for the removal of the soft cataract."

It behoves the editor to withhold therefore his opinion of the proper treatment of cataract, until a little more experience shall have enabled the medical world to judge of the new operations, some of which are as yet involved in secrecy. He will, however, take the liberty to state the result of his own experience in the treatment of cataract in the manner contrived by Mr. Saunders, and improved by Mr. Adams. Between the 25th of April 1814, and the 25th of October 1815, he has performed Mr. Saunders' operation improved by Adams, in eighteen cases: eight of the patients are completely cured:

in two of the eight, both eyes are well; in the others, only one has been operated on: two of the patients having become impatient, have been cured by extraction. It has failed in two cases, having been followed by violent inflammation, and an obliterated pupil. In the rest, (which are still under treatment,) there is every prospect of success.

The mode of operating which the editor has pursued, consists in dilating with the stramonium,* the pupil, and then introducing the needle of Saunders through the cornea; by the free use of which the capsule and lens are to be torn in pieces: fragments of the lens can often be pushed forward into the anterior chamber of the eye, where they speedily dissolve. An absolute division of the lens into two equal parts, as accomplished by Mr. Adams, the editor has never effected; nor does he believe it important to the success of the operation.

In addition to these remarks it may not be uninteresting to state, that Dr. Physick has successfully performed the ancient operation of sucking out a cataract by a small tube introduced through a puncture in the cornea. The operation is, however, attended with difficulties which will necessarily prevent its general adoption, and a description of it is therefore omitted.]

On the subject of the cataract, consult particularly *Celsus De Re Medicâ*. *Pott's Remarks on the Cataract*, Vol. 3, of his *Chirurgical Works*. *Dauiel sur une Nouvelle Méthode de Guérir la Cataracte par l'Extraction du Crystallin*, in *Mém. de l'Acad. de Chirurgie*, Tom. 5, p. 369, Edit 12mo *Wenzel's Treatise on the Cataract*, by Ware. *Richter's Treatise on the same subject*, and his *Anfangsgründe der Wundarzneykunst*, Band 3. *Ware's Chirurgical Observations on the Eye*, 2 Vol. Edit. 3. *Scarpa's Observations on the Principal Diseases of the Eyes*. *Hey's Practical Observations in Surgery*. *Saunders on Diseases of the Eye*, by Farre. *Beer's Practische Beobachtungen über den grauen Staar*, &c. Vienna, 1791. *Lassus, Pathologie Chirurgicale*, Tom. 2, p. 504, &c. Edit 1809. *Léveillé, Nouvelle Doctrine Chirurgicale*, Tom. 3, p. 308, &c. *Richerand's Nosographie Chirurgicale*, Tom. 2, p. 84, Edit. 2. *Adams on the Eye*.

CATHETER. (from καθίζω, to thrust into.) A tube which is introduced through the urethra into the bladder, for the purpose of drawing off the urine. (See *Urine*, *Retention of*.) Of course there are two kinds of catheters, one intended for

* Either the extract, or tincture, may be used.

the male, the other for the female urethra. The common catheter is a silver tube, of such a diameter as will allow it to be introduced with ease into the urethra, and of various figures and lengths, according as it is intended for the young or adult, the male or female, subject. A common male catheter is ten or eleven inches long. In general, a large instrument of this kind, like a large bougie, will enter the bladder with more ease than a small one, because less likely to be entangled in the lacunæ of the urethra. One-third of the male catheter, towards its point, should be moderately curved; the other two-thirds, towards its handle, should be straight. The instrument, when gently curved, is found to be more easy of introduction than when it is very much bent. The female catheter is straight, excepting a slight curvature towards its point, and it is about six inches long.

The catheter, as it need not enter far into the neck of the bladder, though it should always be as big as the urethra will easily admit, should not, says John Bell, be long, and should have a very gentle and simple curve. (*Principles of Surgery*, Vol. 2, p. 193.)

The common flexible catheter is only a hollow bougie, and the elastic one contains in its composition elastic gum. The two last descriptions of catheters have the advantage of being less irritating to the urethra, and less apt to become covered with calculous incrustations, than silver tubes. They can also be frequently introduced when an inflexible metallic one will not pass.

Flexible catheters are now generally made of woven silk cylinders, covered with a coat of elastic gum. The best have hitherto been fabricated by M. Bernard, of Paris; but they are at present well manufactured by Mr. Walsh, of London. Their size and form vary, according to the age or sex of the patient. Bernstein, in his Dictionary of Surgery, gives the following account of this instrument, as it is fabricated in Germany: "One of the most useful inventions which have been made, with respect to these instruments, is to construct them of elastic gum, and the merit of this invention is to be ascribed, without doubt, to Theden. *Neue Bemerkungen u. Erfahrungen, &c. Th. 2. Berlin, 1782, p. 143.* They were afterwards improved by a silversmith at Paris, of the name of Bernard, who directed not to apply the dissolved elastic gum to a wire cylinder, as Theden had done, but to one made of knitted silk; and these catheters certainly deserve to be recommended in preference to all others. But with respect to their price, the elastic catheters,

that are prepared by Pickel, of Wirzburg, (*Richter's Chir. Bibliothek, B. 6, p. 512,*) deserve particular recommendation.—These consist of silk cylinders, plaited, or worked upon a probe, and afterwards covered with the following varnish: three parts of white-lead, minium, or sugar of lead, with boiled linseed oil, which is the common varnish used by cabinet-makers, mixed with one part of melted amber, and the same quantity of oil of turpentine. With this varnish he spreads the silk cylinders, and repeats this three times, as soon as the former coating has dried in the open air; after which he puts the catheters into a baker's oven 24 hours, when bread has been baked in it the last time, and when it retains the temp. of 60. 70. Reaum. Here he lets them remain 10 or 12 hours. When he has taken the catheter out of the oven, he rubs the inequalities off with a little pumice-stone, sews up the end, cuts into it the oblong lateral aperture, and then spreads it 12 or 15 times more with the varnish. Every time, however, the catheter must be well dried in the open air, before the varnish is spread upon it again, and after every third coating which it has received, it must be put into the oven again, so that it must in all have received from 15 to 18 coatings with varnish, and have been laid five or six times in the oven. The end is smoothed off with oil. Each of these catheters costs a dollar." (*Cyclopædia by Rees, Art. Catheter.*)

Sometimes it is difficult to introduce the inflexible catheter, in consequence of the urethra and neck of the bladder being affected with spasm. In this case a dose of opium should be administered, before a second attempt is made. When inflammation prevails in the passage, the introduction may often be facilitated by a previous bleeding.

The operation of introducing the catheter may be performed, either when the patient is standing up, sitting, or lying down.

In doing it, one of the most important maxims is, never to force forward the instrument, when it is stopped by any obstacle. If there are no strictures, the stoppage of the catheter is always owing to one of the following circumstances. Its beak may be pushed against the os pubis. This chiefly occurs when the handle of the instrument is prematurely depressed. Here the employment of force can obviously do no good, and may be productive of serious mischief. The beak of the catheter may take a wrong direction, and push against the side of the urethra, especially at its membranous part, which it may dilate into a kind of pouch.

In this circumstance, if force were exerted, it would certainly lacerate the urethra, and occasion a false passage. The end of the catheter may get entangled in a fold of the lining of the urethra, and here force would be equally wrong. Lastly, the point of the instrument may be stopped by the prostate gland, in which case force can be of no service, and may do great harm. Hence it is always proper to withdraw the instrument a little, and then push it gently onward in a different position.

The operation may be divided into three stages. In the first, the catheter passes, in the male subject, that portion of the urethra which is surrounded by the corpus spongiosum; in the second, it passes the membranous part of the canal, situated between the bulb and the prostate gland; and in the third, it enters this gland, and the neck of the bladder.

In the first stage, little trouble is usually experienced: for the canal is here so supported by the surrounding corpus spongiosum, that it cannot easily be pushed into the form of a pouch, in which the end of the instrument can be entangled. The operator need only observe the following circumstance: the penis should be held, by placing the corona glandis between the thumb and the index finger of the left hand; in this way the entrance of the urethra will not be at all compressed. The penis is then to be drawn upward: the catheter being well oiled, is now to be introduced, with the concavity towards the abdomen, into the urethra, directly downward, until its point reaches the bulb. As soon as this is accomplished, and the beak of the instrument has passed under the arch of the pubes, the surgeon must very slowly bring the handle of the catheter forwards, between the patient's thighs, and, as he is doing this, the beak of the instrument becomes elevated, and glides into the bladder. In this stage of the operation the penis must be allowed to sink down, and not be kept tense, as this would only drag the membranous part of the urethra against the os pubis, and render the passage of the instrument more difficult.

The operation, however, is not always successfully accomplished in this manner. The beak of the catheter may be stopped by the os pubis; it may take a wrong direction, so as to push the membranous part of the urethra to one side or the other; or it may be stopped by a fold of the lining of the passage.

The first kind of impediment is best avoided, by not depressing the handle of the catheter too soon; that is, before the point has passed beyond the arch of the

pubes. When the membranous part of the urethra is pushed to one side or the other, the instrument ought to be withdrawn a little, and then pushed gently on in a different direction. When this expedient is unavailing, the index finger of the left hand may be introduced into the rectum, for the purpose of supporting the membranous part of the urethra, and finding the extremity of the catheter.

When the prostate gland is enlarged, the diameter of the urethra does not undergo any diminution as it passes through the diseased body; but it turns up very suddenly, just as it approaches the bladder. In such cases, the end of the catheter should be more bent upward, than the rest of its curvature.

In the third stage of the operation, the beak of the instrument has to pass the prostate gland and neck of the bladder. The principal obstacles to its passage, in this situation, arise from spasm of the neck of the bladder, and from the instrument being pushed against the prostate gland. The first impediment may generally be obviated by waiting a few moments, and gently rubbing the perineum, before pushing onward the catheter. The hindrance, caused by the prostate, is best eluded by using an instrument the point of which is more curved than its other part. Sometimes the surgeon himself presses the prostate towards the os pubis, by means of his finger in the rectum, and thus prevents the passage of the catheter, by increasing the sudden curvature at this part of the urethra. Hence, as Richter observes, it is a very important maxim, never to introduce the finger so far into the rectum, as to press on the prostate gland itself.

When the catheter has turned round the pubes, and is just about to enter the neck of the bladder, is the critical moment, in which may be seen, whether a surgeon can, or cannot pass a catheter; for, if he knows how to pass it, he suddenly, but not violently, changes its direction. He depresses the handle with a particular kind of address, and raises the point, which, as if it had suddenly surmounted some obstacle, starts into the neck of the bladder, and the urine bursts out in a jet from the mouth of the catheter.

They, who are unskilful, press the tube forward, and persist, as they had begun, in drawing up the penis, on the supposition that by stretching this part they lengthen the urethra, and make it straight, whereas they elongate only that part of the canal, along which the catheter has already passed. (*John Bell's Principles of Surgery, Vol. 2, p. 213.*)

Mr. Ware passes the catheter in the

following manner: the instrument being first thoroughly oiled, he introduces it into the urethra, with its convex part uppermost, and carries it as far as it will pass without using force. He then turns it *slowly* round, so as to bring its concave side uppermost; and in doing this he makes a large sweep with the handle of the instrument, and at the same time keeps his attention steadily fixed on its apex, which he takes particular care not to retract, nor to move from its first line of direction. When the catheter is turned, it must still be pressed onward, and its handle at the same time gently depressed. By this method, says Mr. Ware, it will be made to enter the bladder.

The catheter, made use of by Mr. Ware, is twelve inches long, which is more than an inch above the ordinary length; and the curvature is larger than common. With this instrument he has often succeeded, when with others of a different size and curvature it was not possible to succeed.

A great number of excellent modern surgeons prefer introducing the catheter as far as the perineum, as Mr. Ware does, with its convexity towards the abdomen. They then keep the point stationary while they make the handle describe a semicircular movement upward, so as to bring the concavity of the instrument towards the pubes. The catheter then becomes situated just as it is in the other method.

Mr. Hey has offered some good practical remarks on the introduction of the catheter. If, says he, the point of the catheter be less turned than the urethra, the point will be pushed against the posterior part of the passage, instead of following the course of the canal. The posterior part of the urethra has nothing contiguous to it which can support it; and no considerable degree of force will push the point of the catheter through that part between the bladder and the rectum. If this accident is avoided, still the point will be pushed against the prostate, and cannot enter the bladder. Mr. Hey tells us, that the truth of this is illustrated, by the assistance which is derived, whenever the catheter stops at the prostate, from elevating the point of the instrument with a finger introduced in the rectum.

Mr. Hey takes notice of the impropriety of pushing forwards the point of the catheter, before its handle is sufficiently depressed, as the point would move in a horizontal direction, and be likely to rupture the posterior side of the urethra.

The difficulty, arising from the inflamed and dry state of the passage, Mr. Hey says, is greatly obviated by the previous

introduction of a bougie well covered with lard.

In order to pass the catheter, Mr. Hey places his patient on a bed, in a recumbent posture, his breech advancing to, or projecting a little beyond, the edge of the bed. If the patient's feet cannot rest upon the floor, Mr. Hey supports the right leg by a stool, or by the hand of an assistant. The patient's head and shoulders are elevated by pillows; but the lower part of the abdomen is left in a horizontal position. Mr. Hey commonly introduces the catheter with its convexity towards the abdomen, and having gently pushed down the point of the instrument, till it becomes stopped by the curvature of the urethra, under the symphysis pubis, he turns the handle towards the navel, pressing at the same time its point. In making the turn he sometimes keeps the handle at the same distance from the patient's abdomen, and sometimes makes it gradually recede; but, in either method, he avoids pushing forwards the point of the catheter any farther than is necessary to carry it just beyond the angle of the symphysis pubes. When he feels that the point is beyond that part, he pulls the catheter gently towards him, hooking, as it were, the point of the instrument upon the pubes. He then depresses the handle making it describe a portion of a circle the centre of which is the angle of the pubis. When the handle of the catheter is brought into a horizontal position, with the concave side of the instrument upwards, he pushes forwards the point, keeping it close to the interior surface of the symphysis pubis; for when passing in this direction, it will not hitch upon the prostate gland, nor injure the membranous part of the urethra.

If the surgeon uses a flexible catheter, covered with elastic gum, it is of great consequence to have the stilet made of some firm metallic substance, and of a proper thickness. Mr. Hey always makes use of brass-wire for the purpose. If the stilet is too slender, the catheter will not preserve the same curvature during the operation; and it will be difficult to make the point pass upwards behind the symphysis pubis in a proper direction. If the stilet is too thick, it is withdrawn with difficulty.

When the stilet is of a proper thickness, this instrument has one advantage over the silver catheter, which is, that its curvature may be increased while it is in the urethra, which is often of great use, when the point approaches the prostate gland.

When the proper manœuvres with an

inflexible catheter do not succeed, the surgeon must change it, taking a bigger or more slender one, with a greater or less curve, according to such observations as he may have made in his first attempt. But if the catheter has been of a good form or commodious size, yet has not passed easily, he should, instead of choosing a rigid catheter of another size or form, take a flexible one for his second attempt. The flexible catheter is generally slender, and of sufficient length, and its shape may be accommodated to all occasions, and to all forms of the urethra; for, having a stiff wire, we can give that wire, either before or after it has passed into the catheter, whatever shape we please; and what is of still greater importance, we can introduce the instrument without, or with the wire, as circumstances may require; or what is more advantageous, we can introduce the wire particularly so as not quite to reach the point of the catheter, but to within two inches or a little more of this part, by which contrivance the point, if previously warmed, and wrought in the hand, has so much elasticity, that it follows the precise curve of the urethra, and yet has sufficient rigidity to surmount any slight resistance. If this too fail, and especially, if there be the slightest reason to suspect, that the resistance is not merely spasmodic, but arises from stricture near the neck of the bladder in a young man, or swelling of the prostate in an old one, we may take a small bougie, turn up the extremity of it with the finger and thumb, so as to make it incline towards the pubes, and allowing no time for the wax to be softened, pass it quickly down to the obstruction, turn it with a vertical or twisting motion, and make it enter the constricted part. On withdrawing it in about ten minutes or a quarter of an hour, the urine generally escapes, or the catheter may now be introduced. (*John Bell's Principles of Surgery, Vol. 2, p. 215.*)

Mr. Hey has found, that in withdrawing the stilet of an elastic gum catheter, the instrument becomes more curved; and he has availed himself of this information, by withdrawing the stilet, as he is introducing the catheter beyond the arch of the pubes, by which artifice the point is raised into the due direction.

Mr. Hey says, you may sometimes, though not always, succeed in introducing an elastic gum catheter, by using one which has acquired a considerable degree of curvature and firmness, by having had a curved stilet kept in it a long while. Introduce this without the stilet, with its concavity towards the abdomen, taking care not to push on the point of the in-

strument, after it has reached the symphysis pubis, until its handle is depressed into a horizontal position.

When it is necessary to draw off the urine frequently, and the surgeon cannot attend often enough for this purpose, a catheter must be left in the urethra, till an attendant, or the patient himself, has learnt the mode of introducing the instrument. (*Hey.*)

Mr. Hey imputes the formation of a false passage, or the rupture of the membranous part of the urethra, generally to the method of pushing forwards the catheter, before its handle has been depressed. In this manner the course of the instrument crosses that of the urethra, and the point of the catheter, pressing against the posterior side of the membranous part of the urethra, is easily forced through the coats of that canal. The want of due curvature in the catheter, and of sufficient bluntness in its point, greatly contribute to facilitate this injury. In this case the point of the instrument passes more readily into the wound, than onward along the urethra against the symphysis pubis. Without this pressure, the point is apt to recede, and not readily enter the membranous part of the urethra.

Mr. Hey surmounted a difficulty of this kind, by bending upwards the point of a silver catheter, so as to keep it more closely in contact with the anterior part of the urethra, and thereby pass over the wound made in the posterior side of the canal. In the instance alluded to, as it was necessary to leave an elastic gum catheter in the urethra, Mr. Hey procured some brass wire of a proper thickness, with which he made a stilet, and, having given it the same curvature as that of the silver catheter, he introduced it about four hours after the preceding operation, and fixed it by tying it to a bag truss.

Mr. Hey sometimes succeeded by partly withdrawing the stilet, at the moment when he wished to increase the curvature of the catheter.

In an instance in which the urethra had suffered a violent contusion, Mr. Hey drew off the urine with a silver catheter of unusual thickness, after he had failed with instruments of a smaller bore. He suspected that the urethra was ruptured, and was obliged to raise the point of the catheter by a finger introduced into the rectum, and to use bleeding, purgatives, the warm bath and opium, before it could be made to pass. The elastic gum catheter was afterwards employed. It is an unsettled point, whether it is best to leave the catheter in the urethra, until the power of expelling the urine is regained, or

to draw off the urine twice a day, and withdraw the catheter after each operation. Mr. Hey thinks that no general rule can be laid down; some patients cannot bear the catheter to remain introduced; others seem to suffer no inconvenience from it. On the whole, however, Mr. Hey commonly prefers removing the catheter. In this manner, he is of opinion, that the power of expelling the urine again is soonest acquired.

To one acquainted with anatomy, the introduction of the female catheter is exceedingly simple. From motives of delicacy to the sex, the instrument should always be passed without any exposure. The surgeon should hold the catheter in his right hand, while he introduces the forefinger of his left hand between the nymphæ so as to feel upon the upper surface of the passage the little papilla, which surrounds, and denotes to the touch, the precise situation of the orifice of the meatus urinarius. Holding the concavity of the catheter forward, the surgeon, guided by the forefinger of his left hand, is then to introduce the instrument upward into the bladder. (See *Urine, Retention of*.) (See *Hey's Practical Observations in Surgery. John Bell's Principles, Vol. 2. Ware on the Catheter. Richter's Anfangsgr. der Wundarzneykunst. Rees' Cyclopædia, Art. Catheter.*)

CATHETERISMUS. (from καθετηρ, the instrument.) A technical word, employed by P. Ægineta, to denote the operation of introducing the catheter.

CATLING, often spelt, in surgical books, *catlin*, is a long, narrow, double-edged, sharp-pointed, straight knife, which is chiefly used, in amputations of the leg and forearm, for dividing the interosseous ligaments and the muscles, &c. situated between the two bones. The catling is frequently made too wide and large, so that it cannot execute its office with the right degree of ease.

CATOMISMOS. Paulus Ægineta signifies by this word the method of reducing a dislocated humerus, by placing the patient's arm over a strong man's shoulder, and making the latter raise him in this position off the ground, by which means, the limb becomes reduced by the weight of the body.

CATULOTICA. (from καταλω, to cicatrize.) Medicines for healing wounds.

CAUSTICS. (from καω, to burn.) *Caustica.* Medicines, which destroy parts by burning, or chemically decomposing them.

The potassa fusa (kali purum,) the potassa cum calce (calx cum kali puro,) the antimonium muriatum, the argenti nitras, the hydrargyri nitrico-oxydum, the aci-

dum sulphuricum, and the cupri sulphas, are the caustics in most frequent use among surgeons.

CAUTERIZATION. (from καυτηριαζω, to cauterize.) *Cauterisatio.* The burning any part with a cautery.

CAUTERY. (from καω, to burn.) *Cauterium.* Cauteries are of two kinds, viz. *actual* and *potential*. By the first term is implied a heated iron; by the second, surgeons understand any caustic application.

CELE. (from κηλεω, to swell out.) A tumour.

CELOTOMIA. (from κηλη, a tumour or hernia, and τεμνω, to cut.) This has two meanings, viz. the operation for a hernia, and castration.

CERATMALGAMA. (from κηρος, wax, and αμαλγαμα, a mixture.) A cerate.

CERATOTOME. (from κερας, a horn, and τεμνω, to cut.) This is the name which Wenzel has given to the knife, which he was in the habit of using to divide the cornea, or horny coat of the eye.

CERATE. (from κηρος, wax, the usual basis of its composition.) *Ceratum.* A composition rather harder than ointment, and softer than plaster.

In this work we need only mention a few particular ones.

CERATUM CALAMINÆ. (L.) A good simple dressing.

CERATUM CALOMELANOS. *℞. Calom. ʒi. Cerati Lapid. Calamin. ʒss. M.* Some practitioners are partial to this as a dressing for chancres.

CERATUM CETACEL. (L.) The spermaceti cerate. A mild unirritating salve for common purposes.

CERATUM CICUTÆ. *℞. Unguenti Cicutæ lbj. (See Unguentum.) Spermatis Ceti ʒij. Ceræ Albæ, ʒij. M.* One of the formulæ at St. Bartholomew's Hospital, occasionally applied to cancerous, scrofulous, phagedenic, herpetic, and other inveterate sores.

CERATUM LYTTEÆ. (L.) This, which was lately called the cerate of cantharides, was once much used for stimulating blistered surfaces, in order to maintain a discharge. The ceratum sabinæ, however, has almost rendered this application useless, as it answers much better, and is not attended with the danger of bringing on strangury, inflammation of the bladder, &c.

CERATUM PLUMBI SUPERACETATIS. (L. Acetite of lead.) A very eligible, mildly astringent, unirritating salve.

CERATUM PLUMBI COMPOSITUM. (L.) Lately the ceratum lithargyri acetati. This is an excellent, unir-

ritating, cooling salve for common purposes.

CERATUM SABINÆ. *g. Sabine Recentis Contusæ Cere Flavæ, sing. lbj. Adipis Suillæ, lbiv.* Mix the savin with the melted wax and hog's lard, and strain the composition.

This is the famous application for keeping open blisters, on the plan recommended by Mr. Crowther. We have noticed in the article *Blisters*, what he says on the subject in the last edition of his work.

CERATUM SAPONIS. (L.) *g. Lithargyri levigati lib. j. Aceti cong. j. Saponis unc viij. Olei olive. Cere flavæ sing. lib. j.*

This is the *soap cerate* of St. Bartholomew's Hospital, and adopted by the College. In preparing it, the utmost caution must be used. The three first ingredients are to be mixed together and boiled gently till all the moisture is evaporated; after which, the wax and oil, previously melted together, must be added. The whole composition, from first to last, must be incessantly and effectually stirred, without which the whole will be spoiled. This formula was introduced into practice by Mr Pott, and is found to be a very convenient application for fractures, and also as an external dressing for ulcers; being of a very convenient degree of adhesiveness, and at the same time possessing the usual properties of a saturnine remedy.

In applying this cerate, spread on linen, in fractures of the leg or arm, one caution is necessary to be observed, namely, that it be in two distinct pieces; for if, in one piece, the limb be encircled by it, and the ends overlap each other, it will form a very inconvenient and partial constriction of the fractured part, in consequence of the subsequent tumefaction. (*Pharm. Chirurg.*)

CERCOSIS. (from *κερκος*, a tail.) An enlargement of the clitoris, which hangs from the vagina like a tail.

CEREBRUM. The brain; for concussion of; compression of, &c. see *Head, Injuries of*. For inflammation of, see *Phrenitis*. For hernia of, see *Hernia Cerebri*.

CERION. (from *κερος*, wax.) A honey-comb. A small sore, with an orifice like the cell of a honey-comb.

CERU'MEN AURIS. A degree of deafness is frequently produced by the lodgment of dry pieces of this substance in the meatus auditorius. The best plan, in such cases, is to syringe the ear with warm water, which should be injected with moderate force.

In some instances, deafness seems to

depend on a defective secretion of the cerumen, and a consequent dryness of the meatus. Here, it is advisable to introduce a drop or two of sweet oil every now and then into the ear, and to apply fomentations.

CERUSSA ACETATA. Sugar of lead. Acetite of lead. This preparation, which is now named by the college *plumbi superacetat*, is well known as an ingredient in a variety of lotions and collyria. It has the qualities of saturnine applications in general, being highly useful for diminishing inflammation.

CHALAZIUM. (from *χάλαζα*, a hail-stone.) This signifies a little tubercle on the eyelid, which has been whimsically supposed to resemble a hail-stone. It is the same as the hordeolum or sty. (See *Hordeolum*.)

CHAMOMILE. The flowers, which are bitter and aromatic, are used in surgery, for making fomentations.

CHANCRE. (from *καρκινος*, cancer venereus.) A sore which arises from the direct application of the venereal poison to any part of the body. Of course it almost always occurs on the genitals. Such venereal sores, as break out from a general contamination of the system, in consequence of absorption, never have the term *chancre* applied to them. (For an account of the nature and treatment of chancres, see *Venereal Disease*.)

CHARPIE. (French.) Scraped linen, or lint.

CHEILOCA'CE. (from *χειλος*, the lip, and *κακον*, an evil.) A swelling, or ulceration of the lip. The same disease as the *Cancrum Oris*, which see.

CHEMOSIS. (from *χαινω*, to gape.) When ophthalmy or inflammation of the eye, is very violent, it frequently happens, that one or more vessels become ruptured on the side next the eyeball, and a quantity of blood is effused into the cellular membrane, which connects the conjunctiva with the anterior hemisphere of the eye. Hence, the conjunctiva becomes gradually elevated upon the eyeball, and projects towards the eyelids, so as to conceal within it the cornea, which appears, as if it were depressed. (*Scarpa*.) In this way the middle of the eye assumes the appearance of a gap, or aperture.

When blood is extravasated under the tunica conjunctiva, there cannot be an easier or more effectual remedy than æther. A few drops are to be poured into the palm of the hand, and diffused over it, which may be immediately done by pressing the other hand against it. The hand is then to be applied to the eye, and kept so close to it, that the spirit, as it

evaporates, may insinuate itself into the part affected, and act on the blood, so as to disperse it. (*Ware on Ophthalmy.*)

In a few instances of chemosis, in which the swelling and inflammation of the conjunctiva have been great, the following application has been found particularly beneficial, after free evacuations: *℞. Interiorum foliorum recentium Lactuce Scissilis, ʒij. Coque cum Aq. Pur. ʒss. In balneo marie pro semihora; tunc exprimatur succus, et applicetur paululum ad oculos et ad palpebras, sæpe in die.* (*Ware.*)

Ophthalmy, attended with chemosis, demands the most rigorous employment of the antiphlogistic treatment. Both general and topical bleeding should be speedily and copiously put in practice, with due regard, however, to the age and strength of the patient. Leeches should be applied to the vicinity of the eyelids, or, what is preferable, the temporal artery should be opened. When the chemosis is very considerable, the distention of the conjunctiva may be relieved by making an incision into this membrane, near its junction with the cornea. (*See Ophthalmy.*)

CHEVASTER or **CHEVASTRE.** A double headed roller, the middle of which was applied to the chin. The bandage then crossed at the top of the head, and passed on each side to the nape of the neck, where it crossed again. Then it was carried up to the top of the head, and so on, till all the roller was exhausted.

CHIAS'TOS. A bandage described by Oribasius, and so called from being similar in shape to the Greek letter χ .

CHIASTRE. A bandage for stopping hemorrhage from the temporal artery. The roller employed is double headed, about an inch and a half wide, and four ells long. The middle of the roller is applied to the unwounded side of the head; the bandage is carried round to the bleeding temple, and there made to cross over a compress on the wound. The roller is then continued over the coronal suture, and under the chin, care being taken to make the bandage cross upon the compress. In this way the roller is applied round the head, till the whole is spent.

CHILBLAINS are the effect of inflammation, arising from cold. A chilblain, in its mildest form, is attended with a moderate redness of the skin, and a sensation of heat and itching, all which symptoms, after a time, spontaneously disappear. In a more violent degree, the swelling is larger, redder, and sometimes of a dark blue colour; and the heat, itching, and pain, are so excessive, that the patient cannot use the part. In the third degree small vesicles arise upon the tu-

mour, which burst and leave excoriations. These are soon converted into ill-conditioned sores, which sometimes penetrate even as deeply as the bone, discharge a thin ichorous matter, and generally prove very obstinate. The worst stage of chilblains is attended with sloughing.

Chilblains are particularly apt to occur in persons, who are in the habit of going immediately to the fire, when they come home in winter with their fingers and toes very cold; they are also particularly frequent in persons, who often go suddenly into the cold, while very warm. Hence, the disease most commonly affects parts of the body, which are peculiarly exposed to these sudden transitions; for instance, the nose, ears, lips, hands, and feet. Richter remarks that they are still more frequently occasioned, when the part, suddenly exposed to cold, is in a moist perspiring state, as well as a warm one. Young subjects are much more liable to this troublesome complaint than adults; and females brought up in a very delicate manner, are generally more afflicted, than the other sex.

The most likely plan of preventing chilblains is to accustom the skin to moderate friction; to avoid hot rooms and making the parts too warm; adapt the quantity and kind of clothing to the state of the constitution, so as to avoid extremes, both in summer and winter; to wash the parts frequently with cold water; to take regular exercise in the open air in all weathers; and to take particular care not to go suddenly into a warm room or very near the fire, out of the cold air.

Although chilblains of the milder kinds are only local inflammations, yet they have some peculiarity in them, for they are not most benefited by the same antiphlogistic applications, which are most effectual in the relief of inflammation in general.

One of the best modes of curing chilblains of the milder kind is to rub them with snow, or ice-cold water, or to bathe them in the latter, several times a day, keeping them immersed each time, till the pain and itching abate. After the parts have been rubbed or bathed in this way, they should be well dried with a towel, and covered with flannel or leather socks.

This plan is perhaps as good a one as any; but it is not that which is always congenial to the feelings and caprice of patients; with the constitutions of some it may even disagree. In such cases, the parts affected may be rubbed with spirit of wine, linimentum saponis, tinctura myrrhæ, or a strong solution of alum, or vinegar. A mixture of oleum terebinthinæ and balsamum copaivæ, in equal

parts, is a celebrated application. A mixture of two parts of camphorated spirit of wine, and one of the aqua lithargyri acetati, has also been praised.

When chilblains have suppurated and ulcerated, the sores require stimulating dressings, such as lint dipped in a mixture of the aqua lithargyri acetati, and aqua calcis; in tinctura myrrhæ, or warm vinegar. If a salve be employed, one which contains the hydrargyrus nitratus ruber, is best. Ulcers of this kind frequently require being touched with the argentum nitratum, or dressed with a solution of it.

Chilblains, attended with sloughing, should be poulticed, till the dead parts are detached. The sores should then be first dressed with some mildly stimulating ointment, such as the unguentum resinæ flavæ. With this, in a day or two, a little of the hydrargyrus nitratus ruber may be mixed; but the surgeon should not venture on the employment of very irritating applications, till he sees what the parts will bear, and whether such will be requisite at all. Were he too bold, immediately he leaves off the poultices, he might even bring on sloughing again.

The reader may find a long list of applications for chilblains in Rees's Cyclopædia, article Chilblains. See also Richter's *Anfangsgr. der Wundarzn.* Band. 1.

CHIMNEY-SWEEPER'S CANCER.

See *Scrotum*.

CHORDEE. (French, from *χρῶδν*, a cord.) When inflammation is not confined merely to the surface of the urethra, but affects the corpus spongiosum, it produces in it an extravasation of coagulable lymph, as in the adhesive inflammation, which uniting the cells together, destroys the power of distention of the corpus spongiosum urethræ, and makes it unequal in this respect to the corpora cavernosa penis, and therefore a curvature takes place at the time of an erection, which is called a *chordee*. The curvature is generally in the lower part of the penis. When the chordee is violent, the inner membrane of the urethra is so much upon the stretch, that it may be torn, and cause a profuse bleeding from the urethra, that often relieves the patient, and even sometimes proves a cure. (*Hunter on the Venereal.*)

This is the *inflammatory* chordee; there is another kind, which has been named *spasmodic*.

In the beginning of the inflammatory chordee, bleeding from the arm is often of service; but it is more immediately useful to take away blood from the part itself by leeches; for we often find, that when a vessel gives way, and bleeds a

good deal, the patient is greatly relieved. Relief may often be obtained by exposing the penis to the steam of hot water. Poultices have also beneficial effects; and both fomentations and poultices will often do more good when they contain camphor. Opium, given internally, is of singular service; and if it be joined with camphor, the effect will be still greater.

When the chordee continues after all inflammation is at an end; no evacuations are required. The consequence of the inflammation will cease gradually by the absorption of the extravasated coagulating lymph. Mercurial ointment rubbed on the part will considerably promote this event. Cicuta has seemed to do considerable good, after the common methods of cure have not availed. Electricity may be of service. A chordee is often longer in going off, than any other consequence of a gonorrhœa, but it disappears at last.

Camphorated mercurial ointment is better than the simple unguentum hydrargyri, to bring about the removal of the extravasated lymph.

The *spasmodic chordee* is very much benefited by bark. (*Hunter on the Venereal.*)

CHRONIC. (from *χρονος*, time.) *Chronicus*. Of long continuance; opposed to acute.

CHYLOPOIETIC ORGANS, or viscera. The parts of the body concerned in the preparation of the chyle, as the liver, gall bladder, pancreas, small intestines, &c. These viscera, with the stomach, compose what some surgical authors name the *gastric system*, and a disordered state of their functions is supposed to be the cause of many medical and surgical diseases. The continental surgeons, perhaps, extend this doctrine beyond the bounds of truth. In our own country, Mr. Abernethy has lately drawn the attention of practitioners to the subject by a publication, which has excited considerable interest and discussion throughout the profession.

CHYMOSIS. See *Chemosis*.

CICATRISANTIA. (from *cicatrice*, to skin over.) Epulotic medicines, or such as dispose wounds and ulcers to heal, and become covered with skin.

CICATRIX. The scar remaining on the skin, after the healing of a wound or ulcer.

CICATRIZATION. The process by which wounds and sores heal. Granulations having been formed, the next object of nature is to cover them with skin. The parts which had receded by their natural elasticity, in consequence of the breach made in them, now begin to be brought together by the contraction of

the granulations. The contraction takes place in every point, but principally from edge to edge, which brings the circumference of the sore towards the centre, so that the sore becomes smaller and smaller, even although little, or no new skin is formed.

The contracting tendency is in some degree proportioned to the general healing disposition of the sore, and looseness of the parts. When granulations are formed upon a fixed surface, their contraction is mechanically impeded; as, for instance, on the skull, the shin, &c. Hence, in all operations on such parts, as much skin should be saved as possible.

When there has been a loss of substance, making a hollow sore, and the contraction of the granulations has begun, and made a good deal of progress, before they have had time to rise as high as the skin, then the edges of the skin are generally drawn down, and tucked in by it, in the hollow direction of the surface of the sore.

The contraction of the granulations continues, till the healing is complete; but it is greatest at first. That there is a mechanical resistance to such contraction, is proved by the assistance, which may be given to the process by the application of a bandage.

Besides the contractile power of the granulations, there is also a similar power in the surrounding edge of the cicatrizing skin, which assists the contraction of the granulations, and is generally more considerable than that of the granulations themselves, drawing the mouth of the wound together, like a purse. The contractile power of the skin is confined principally to the very edge, where it is cicatrizing, and, as Mr. Hunter believed, to those very granulations, which have already cicatrized; for, the natural or original skin surrounding this edge does not contract, or at least not nearly so much, as appears by its having been thrown into folds and plaits, while the new skin is smooth and shining.

The uses of the contraction of granulations are various. It facilitates the healing of a sore, as there are two operations going on at the same time, viz. contraction and skinning.

It avoids the formation of much new skin, the advantage of which is evident; for it is with the skin as with all other parts of the body, viz. that such as are originally formed are much fitter for the purposes of life, than those that are newly formed, and not nearly so liable to ulceration.

When the whole surface of a sore has skinned over, the substance, the remains of the granulations, on which the new skin is formed, still continues to contract, till hardly any thing more is left than what the new skin stands upon. This is a very small part, in comparison with the first formed granulations, and it in time loses most of its apparent vessels, becoming white and ligamentous. All new healed sores are at first redder than the common skin, but in time they become much whiter.

As the granulations contract, the surrounding old skin is stretched to cover the part, which had been deprived of skin.

When a sore begins to heal, the surrounding old skin, close to the granulations, becomes smooth, and rounded with a whitish cast, as if covered with something white. This, Mr. Hunter supposed to be a beginning cuticle, and it is as early and sure a symptom of healing as any. While the sore retains its red edge all round, for perhaps a quarter, or half an inch in breadth, we may be certain it is not a healing one.

Skin is a very different substance, with respect to texture, from the granulations upon which it is formed; but it is not known, whether it is a new substance formed by the granulations, or a change in the surface of the granulations themselves.

The new skin most commonly takes its rise from the surrounding old skin, as if elongated from it; but not always. In very large sores, but principally old ulcers, in which the edges of the surrounding skin have but little tendency to contract, and the cellular membrane underneath to yield, or the old skin to become drawn over the ulcerated surface, the nearest granulations do not acquire a cicatrizing disposition. In such cases, new skin forms in different parts of the ulcer, standing on the surface of the granulations, like little islands.

Whatever change the granulations undergo to form new skin, they are generally guided to it by the surrounding skin, which gives this disposition to the surface of the adjoining granulations.

The new-formed skin is never so large as the sore was, on which it is formed, owing to the contraction of the granulations, and the yielding of the surrounding old skin. If the sore is situated where the adjoining skin is loose, as in the scrotum, then the contractile power of the granulations being quite free from obstruction, a very little new skin is formed; but if the sore is situated where

the skin is fixed or tense, the new skin is nearly as large as the sore.

The new skin is at first commonly on the same level with the old. This however is not the case with scalds and burns, which frequently heal with a cicatrix, higher than the skin, although the granulations have been kept from rising higher than this part.

The new-formed cutis is neither so yielding nor so elastic as the original is; it is also less moveable. It gradually becomes, however, more flexible and loose. At first it is very thin and tender, but it afterwards becomes firmer and thicker. It is a smooth continued skin, not formed with those insensible indentations, which are observed in the natural or original skin, and by which the latter admits of any distention, which the cellular membrane itself will allow of.

This new cutis, and indeed all the substance which had formerly been granulations, is not nearly so strong, nor endowed with such lasting and proper actions, as the originally formed parts. The living principle itself is less active; for when an old sore breaks out, it continues to yield, till almost the whole of the new-formed matter has been absorbed, or has mortified.

The young cutis is extremely full of vessels; but these afterwards disappear, and the part becomes white.

The surrounding old skin, being drawn toward the centre by the contraction of the granulations, is thrown into loose folds, while the new skin itself seems to be upon the stretch, having a smooth shining appearance.

The new cuticle is more easily formed from the cutis, than the cutis itself from granulations. Every point of the surface of the cutis is concerned in forming cuticle, so that this is forming equally every where at once; but the formation of the cutis is principally progressive from the adjoining skin.

The new cuticle is at first very thin, and rather pulpy than horny. As it becomes stronger, it looks smooth and shining, and is more transparent than the old cuticle.

The rete mucosum is later in forming than the cuticle, and in some cases never forms at all. In blacks who have been wounded, or blistered, the cicatrix is a considerable time before it becomes dark; and in one black, whom Mr. Hunter saw, the scar of a sore, which had been upon his leg when young, remained white when he was old. Many cicatrices of blacks, however, are even darker than any other parts

of the skin. (*Hunter on the Blood, Inflammation, &c.*)

CICUTA. (*Conium Maculatum. Hemlock.*) This is a medicine, to which my observations in practice incline me to impute considerable efficacy in several surgical diseases. However, there is no doubt, that when it is represented as a certain cure for cancer, and scrofula, exaggeration is employed. It is an excellent remedy for irritable painful sores of the scrofulous kind, and it will complete the cure of many ulcers, in which the venereal action has been destroyed by mercury, though the healing does not proceed in a favourable way. Cicuta is likewise beneficial to several inveterate malignant sores, particularly, some which are every now and then met with upon the tongue. It is an eligible alternative in cases of *noli me tangere*, *tinea capitis*, and various herpetic affections. I have seen some enlargements of the female breast give way to hemlock conjoined with calomel. Some swellings of the testes also yield to the same medicines. Cicuta certainly has not the power of curing cancer; but, its narcotic anodyne qualities tend to lessen the pain of that distemper, so as to render it by no means a contemptible remedy in that intractable kind of case.

Respecting hemlock, Mr. Pearson observes, that the extract and powder may be sometimes given with evidently good effect in spreading irritable sores; whether they are connected with the active state of the venereal virus, or whether they remain after the completion of the mercurial course; and it would seem, that the benefit, conferred by this drug, ought not to be ascribed solely to its anodyne qualities, since the same advantages cannot always be obtained by the liberal exhibition of opium, even where it does not disagree with the stomach. He states, that cicuta is almost a specific for the venereal ulcers, which attacks the toes at their line of junction with the foot, and which frequently become gangrenous. Also, in spreading sores, which are accompanied with great pain, and no appearance of remarkable debility, hemlock will often do more than bark, vitriol, or cordials. (*Pearson on Innes Venera.*) The common mode of exhibiting hemlock is in the form of pills, made of the extractum conii, five grains to each. However, I have always thought three grains sufficient to begin with, the dose being afterwards gradually augmented. It is curious how large a quantity may at last be taken in this manner. Mr. J. Wilson, in his *Pharmacopœia Chirurgica*

gica, informs us of a remarkable case of a cancerous ulcer, for which the patient took a hundred and twenty pills, each consisting of five grains of the extractum conii, in twenty-four hours, and this without any benefit being produced, or any inconvenience to the patient.

The stomach being a little disordered, and the head somewhat giddy, is a sign of the dose being sufficiently strong.

"According to some writers, but more particularly Dr. Withering, there are several ways in which the views of a medical practitioner, in prescribing this remedy, may be frustrated. The plant chosen for preparing the extract, may not be the true *conium maculatum*, which is distinguished by red spots along the stalk. It may not be gathered when in perfection, namely, when beginning to flower. The inspissation of the juice may not have been performed in a water-bath, but, for the sake of dispatch, over a common fire. The leaves, of which the powder is made, may not have been cautiously dried and preserved in a well stopped bottle; or if so, may still not have been guarded from the ill effects of exposure to light. Or, lastly, the whole medicine may have suffered from the mere effects of long keeping. From any of these causes, it is evident, the powers of cicuta may have suffered; and it happens, no doubt, very frequently, that the failure of it ought, in fact, to be attributed to one or other of them" (*Pharmacopœia Chirurgica*, published 1802, p. 174)

I have sometimes prescribed as an alterative, with manifest benefit in several surgical diseases, a pill, containing three grains of extractum conii, one of hydrargyri submurias (calomel,) and one of antimonii sulphuretum præcipitatum.

CILIOSIS. (from *cilius*, the eye-lid.) A spasmodic trembling of the eye-lids.

CINCHONA. As one of the designs of this dictionary is to embrace the subjects of a surgical pharmacopœia, peruvian bark, which is administered in a multiplicity of surgical cases, cannot be passed over in silence.

Its great repute for its virtues in stopping mortifications, and accelerating the separation of the sloughs, every person, whether of the medical profession or not, has frequently heard of. Indeed, so high is the character of the medicine, that many practitioners order it in some stage, or another, of almost every distemper, often prescribe it when it is totally useless, give it when it actually does harm, and make their patients swallow such quantities as operate perniciously, when smaller doses would effect striking benefit. Some men are credulous enough to think, that from

the peruvian bark vigor and strength are directly extricated, and infused into the constitution, in exact proportion to the quantity of the medicine, which the stomach will keep down and digest.

While a doctrine of this sort prevails, we must expect to see indiscriminate and erroneous practice. The generality of diseases will always be attended with an appearance of languor and weakness, and, certainly, while there exists a supposition, that a drug is at hand, possessing the quality of evolving and communicating strength, it would be absurd to fancy, that so important an article will not be largely exhibited in a multiplicity of surgical cases. I shall not presume to hazard an idea of the powers of the peruvian bark in the practice of physic; but, I have not the least doubt, that they have been unwarrantably exaggerated in surgery, so as to blind and prejudice many a practitioner of good abilities, and lead him to adopt injudicious and hurtful methods of treatment.

Under particular circumstances, bark has undoubtedly the quality of increasing the tone of the digestive organs; and, of course, whenever the indication is to strengthen the system by nourishing food, and the appetite fails, this medicine may prove of the highest utility, provided it is given in moderate doses, and it appears to agree with the stomach and bowels. But, the plan of making the patient swallow as much of the medicine as can be got into his stomach, must, in my opinion, be invariably followed by bad, instead of good effects. How can it be reasonably expected, that the stomach, which is already out of order, can be set right by having an immoderate quantity of any drug whatever forced into it? In fact, if the alimentary canal were in a healthy state, must not such practice be likely to throw it into a disordered condition?

Bark is an excellent medicine, when judiciously administered; but, like every other good medicine, in bad hands, it may be the means of producing the worst consequences. How much good does mercury effect in an infinite number of surgical diseases, when prescribed by a surgeon of understanding; what a poison it becomes under the direction of an ignorant practitioner! With respect to cases of mortification, bark is often most strongly indicated, when the sloughing is not surrounded with active inflammation, when the patient is debilitated, and his stomach cannot take nutritious food. I have always regarded the notion of giving bark, as a specific for gangrene, as totally unfounded and absurd. I have watched its effects in these cases, and could never

discern, that it had the least peculiar power of operating directly upon the parts, which are distempered. Whatever good it does, is by its improving the tone of the digestive organs, and making them more capable of conveying nourishment, and, of course, strength into the constitution.

I should feel myself guilty of a degree of presumption in speaking thus freely upon this subject, were not my sentiments in some measure supported by those of certain surgical writers, the remembrance of whom will always be hailed with unfeigned veneration and esteem. Mr. Samuel Sharp was not bigotted to bark, and, while he allowed it to possess a share of efficacy, he would not admit, that it was capable of miraculously accomplishing every thing, which the ignorant or prejudiced alleged. "I know," says he, "It will be looked upon by many, as a kind of scepticism, to doubt the efficacy of a remedy, so well attested by such an infinity of cases; and, yet, I shall frankly own, I have never clearly to my satisfaction, met with any evident proofs of its preference to the cordial medicines usually prescribed; though I have a long time made experiment of it with a view to search into the truth.

"Perhaps, it may seem strange, thus to dispute a doctrine established on what is called matter of fact; but, I shall here observe, that in the practice of physic and surgery, it is often exceedingly difficult to ascertain a fact. Prejudice, or want of abilities, sometimes misleads us in our judgment, where there is evidently a right and a wrong; but, in certain cases, to distinguish how far the remedy, and how far nature operate, is probably above our discernment. In gangrenes, particularly, there is frequently such a complication of unknown circumstances, as cannot but tend to deceive an unwary observer. Mortifications arising from mere cold, compression, or stricture, generally cease upon removing the cause, and are, therefore seldom proper cases for proving the power of the bark. However, there are two kinds of gangrene, where internals have a fairer trial; these are a spreading gangrene from an internal cause, and a spreading gangrene from violent external accidents, such as gunshot wounds, compound fractures, &c. Yet, even here we cannot judge of their effect with absolute certainty; for, sometimes, a mortification from internal causes is a kind of critical disorder. There seems to be a certain portion of the body destined to perish, and no more; of this we have an infinity of examples brought into our hospitals, where the gangrene stops at a particular point, without the

least assistance from art. The same thing happens in the other species of gangrene from violent accidents, where the injury appears to be communicated to a certain distance, and no farther; though, by the way, I shall remark in this place, contrary to the received opinion, that gangrenes from these accidents, (where there has been no previous straitness of bandage,) are as often fatal, as those from internal causes.

"As I have here stated the fact, we see how difficult it is to ascertain the real efficacy of this medicine; but, had bark in any degree, those wonderful effects in gangrenes, which it has in periodical complaints, its pre-eminence would no more be doubted in the one case, than in the other. What, in my judgment, seems to have raised its character so high, are the great numbers of single observations published on this subject, the authors of which not having frequent opportunities of seeing the issue of this disorder, under the use of cordials, &c. and some of them, perhaps, prejudiced with the common supposition, that every gangrene is of itself mortal, have therefore ascribed a marvellous influence to the bark, when the event has proved successful."—(*Sharp's Crit. Enq. chap. 8, on Amputation*)

Some further remarks on this subject will be reserved for the article *Mortification*.

According to Mr. Bromfield, bark is a specific for old ulcers, where the inflammation seems circumscribed at the distance of an inch round the sore, the surface of the ulcers looks glossy, and the discharge is extremely thin and very offensive, with little or no sleep, from the violence of the pain. He further observes, that the addition of opium, as circumstances may require, will often be found necessary. (*Surgical Observations and Cases, Vol. 1, p. 132.*)

Bark is given so extensively in the practice of surgery, that there are few important cases, in which in certain circumstances, and at some period or another, it is not indicated. When persons have been weakened by a course of mercury, or by the effects of any disease whatsoever, moderate doses of bark will frequently be found of great service. But, it only becomes so on the principles above suggested, and, as far as my judgment extends, this medicine should never be prescribed in any surgical cases in excessive and unreasonable quantities.

The yellow bark, or the cortex cinchonæ cordifoliæ of the new pharmacopœia, is said to possess more efficacy, than the other kinds.

CINCLESIS, CINCLIS, or CIN-

κίσμος. An involuntary winking, or trembling motion of the eyelids.

CINNABAR, ARTIFICIAL. (*Hydrargyri Sulphuretum rubrum.*) Is chiefly employed by surgeons for fumigating venereal ulcers. An apparatus is sold in the shops for this purpose. The powder is thrown upon a heated iron, and the smoke is conducted by means of a tube to the part affected.

CINZILLA. (*Zona.*) A kind of herpes surrounding the body like a girdle.

C'ON. Hippocrates uses the word κίων, to denote a fleshy excrescence in the pendulum muliebri.

CIONIS. (from κίων, the uvula.) A diseased and painful enlargement of the uvula.

CIRCUMCISION. (from *circumcido*, to cut round.) The operation of cutting off a circular piece of the prepuce, sometimes practised in cases of phimosis. (See *Phimosis.*)

CIRSOCELE. (from κίρσος, a varix, and κήλη, a tumour.) The cirsocele is a varicose distention and enlargement of the spermatic vein; and whether considered on account of the pain, which it sometimes occasions, or on account of a wasting of the testicle, which, now and then follows it, may truly be called a disease. It is frequently mistaken for a descent of a small portion of omentum. The uneasiness which it occasions, is a dull kind of pain in the back, generally relieved by suspension of the scrotum. It has been resembled to a collection of earthworms; but whoever has an idea of a varicose vessel, will not stand in need of an illustration by comparison. It is most frequently confined to that part of the spermatic process, which is below the opening in the abdominal tendon; and the vessels generally become rather larger, as they approach the testis. Mr. Pott never knew any good effect from external applications of any kind.

In general the testicle is perfectly unconcerned in, and unaffected by, this disease; but it sometimes happens, that it makes its appearance very suddenly, and with acute pain, requiring rest and ease; and sometimes after such symptoms have been removed, Mr. Pott has seen the testicle so wasted as hardly to be discernible. He has also observed the same effect from the injudicious application of a truss to a true cirsocele; the vessels, by means of the pressure, became enlarged to a prodigious size, but the testicle shrunk to almost nothing. (*Pott's Works, Vol. 2.*)

The cirsocele is more frequently than any other disorder, mistaken for an omental hernia. As Mr. Astley Cooper re-

mains, when large, it dilates upon coughing; and it appears in an erect, and retires in a recumbent, posture of the body. There is only one sure method of distinguishing the two complaints: place the patient in a horizontal posture, and empty the swelling by pressure upon the scrotum; then put the finger firm upon the upper part of the abdominal ring, and desire the patient to rise; if it is a hernia, the tumour cannot re-appear, as long as the pressure is continued at the ring; but if a cirsocele, the swelling returns with increased size, on account of the return of blood into the abdomen being prevented by the pressure. (*A. Cooper on Inguinal Hernia.*)

The cirsocele can generally only be palliated, and seldom radically cured. When the complaint is attended with pain, cold saturnine, and alum, lotions may be applied to the testicle and spermatic cord. At the same time, blood should be repeatedly taken away by means of leeches; the bowels should be kept gently open; the patient should be placed in a horizontal posture; and the testicle should be supported in a bag-truss.

In general, the patient only finds it necessary to keep up the testicle by this kind of suspensory bandage.

Gooch, and other writers, have related cases of cirsocele, in which the pain was so intolerable and incurable, that nothing but castration could afford the patient any relief.

CIRSOS. (from κίρσος, to dilate.) A varix, or preternatural distention of any part of a vein.

CLAP. (See *Gonorrhœa.*)

CLAUDICATIO. (from *claudico*, to halt.) Halting or limping.

CLAVICLE. (*dim. of clavis, a key.*) *Clavicula* or *Claviculus*. The collar bone, so named from its likeness to an ancient key. (See *Dislocations and Fractures.*)

CLAVUS. (a nail.) In Amatus Lusitanus, a kind of instrument for enabling persons with carious palates, to articulate better. Also, a hard tubercle in the uterus. Clavus besides signifies the common little tumour well known by the name of corn. (See *Corns.*)

CLITORISMUS. (from κλειδορίς, the clitoris.) A morbid enlargement of the clitoris.

CLUNESIA. (from *clunes*, the buttocks.) An inflammation of the buttocks.

CLYSTER. (from κλύζω, to cleanse.) *Clyma*, *Clysterium*. An enema, or liquid injected into the anus. (See *Enema.*)

COALESCENCE. (from *coalesco*, to grow together.) *Coalescentia*. The union

or growing together of parts, which before were separated.

COCYX. Fractures and Dislocations of. (See *Fracture* and *Dislocation*.)

CODESE/LLA, A carbuncle.

CODOCELE. (from *κωδία*, a bulb, and *κηλη*, a tumour.) A bubo.

CŒLOMA. (from *κοίλος*, hollow.) A round hollow ulcer on the cornea.

COLIC, usually denotes pain in the abdomen, especially about the navel, with vomiting and costiveness; but, physicians discriminate several species of the affection.

COLLIQUATIVE SWEAT. A profuse symptomatic perspiration. A diarrhoea of this sort is sometimes termed *colliquative*.

COLLISION. (from *collido*, to beat together.) When any part of the body, and some hard substance are driven at the same time against each other, a collision is said to take place.

COLLOBOMA. (from *κολλάω*, to glue together.) An adhesion between the eyelids.

COLLUTORIUM. (from *colluo*, to cleanse.) A gargle, or wash for the mouth.

COLLUVIES. (from *colluo*, to cleanse.) The discharge from an old sore.

COLLYRIS. (*καλλαρεις*, a little round cake.) A bump caused by a blow.

COLLYRIUM. (from *κόλυω*, to restrain, because it stops the inflammation.) An application to the eyes, and generally an eye-water.

The following are some of the most useful collyria.

COLLYRIUM ACIDI ACETICI.—*R.* Aceti Distillati \mathfrak{z} j. Spiritus Vini Tenioris \mathfrak{z} ss. Aq. Rosæ \mathfrak{z} vij. Misce. The strength to be diminished, or increased, as circumstances may require. This collyrium is recommended for weak watery eyes, and for relieving pain in the organs, after exerting them on any objects. It is also said to be useful for the scrofulous ophthalmia. (See *Wilson's Pharm. Chir. p. 66.*)

COLLYRIUM ALUMINIS. *R.* Aluminis purif \mathfrak{z} j. Aq. rosæ \mathfrak{z} j. This is a good astringent collyrium, employed at Guy's Hospital.

COLLYRIUM AMMONIÆ ACETATÆ. *R.* Aq. ammon. acet. Aq. rosæ sing. \mathfrak{z} j. M.

COLLYRIUM AMMONIÆ ACETATÆ CAMPHORATUM. *R.* Collyrii ammon. acet. Misturæ camphoratæ sing. \mathfrak{z} ij. M.

COLLYRIUM AMMONIÆ ACETATÆ OPIATUM. *R.* Collyrii ammon. acet. \mathfrak{z} iv. Tinct. opii. gutt. xl. M.

COLLYRIUM CERUSSÆ ACETATÆ. *R.* Aquæ rosæ \mathfrak{z} vj. Cerussæ Acetatæ \mathfrak{z} ss. Misce. This is a good application to the eyes, when one of a gently astringent, cooling quality is indicated.

COLLYRIUM CUPRI VITRIOLATI CAMPHORATUM. *R.* Aq. Cupri vitriolati camphoratæ \mathfrak{z} ij. Aq. distillatæ \mathfrak{z} iv. M. Recommended by Mr. Ware, for the purulent ophthalmia of children.

COLLYRIUM HYDRARGYRI MURIATI. *R.* Hydrarg. muriati grss. Aq. distillat. \mathfrak{z} iv. M. This collyrium is fit to be employed, after the acute stage of the ophthalmia has for some time subsided, and it will disperse many superficial opacities of the cornea.

COLLYRIUM LITHIARGYRI ACETATATI. *R.* Aq. distillatæ \mathfrak{z} iv. Aq. litharg. acet. gutt. x. M.

COLLYRIUM OPIATUM. *R.* Opii. Extracti gr. x. Camphoræ gr. vj. Aquæ distillatæ ferventis \mathfrak{z} xii. Beat the two first ingredients together in a mortar, and mix the hot water gradually, and strain the fluid.

This collyrium is recommended in some ophthalmics attended with great pain and swelling. (See *Wilson's Pharm. Chir. p. 70.*)

COLLYRIUM ZINCI VITRIOLATI. Zinci vitriol. gr. v. Aq. distillatæ \mathfrak{z} iv. M. This is the most common collyrium of all: it may be gradually made stronger.

COLLYRIUM ZINCI VITRIOLATI CUM MUCILAGINE SEMINIS CYDONII MALI. *R.* Aq. plantaginis \mathfrak{z} iv. zinci vitriol. gr. v. et mucil. sem. cydon. mal. \mathfrak{z} ss. M.

In order to check the morbid secretion from the eye-lids, in cases of the fistula lachrymalis, or what Scarpa calls *il flusso palpebrale puriforme*, this celebrated Professor recommends a few drops of the above collyrium to be insinuated between the eye-lids and eye.

COLON, *Fruit stones lodged in.* (See *Alvine Concretions.*)

COLPOCELE. (from *κολπος*, the vagina, and *κηλη*, a tumour.) A tumour, or hernia, situated in the vagina.

COLPOPTOSIS. (from *κολπος*, the vagina, and *πτίω*, to fall down.) A bearing or falling down of the vagina. (See *Vagina, Prolapsus of.*)

COMA. (from *κω* or *κειω*, to lie down) Anciently any total suppression of the powers of sense; but now it means a lethargic drowsiness. It is a symptom of several surgical disorders.

COMATOSE. *Comatosus.* Lethargic.

COMMUNUTED. (from *commينو*, to

break in pieces.) A fracture is termed *comminuted*, when the bone is broken into several pieces.

COMPRESS. (from *comprimo*, to press upon.) *Compressa*. A compress. Folded linen, lint, or other materials, making a sort of pad, which surgeons place over those parts of the body on which they wish to make particular pressure, and, for this purpose, a bandage is usually applied over the compress. Compresses are also frequently applied to prevent the ill effects, which the pressure of hard bodies, or tight bandages, would otherwise occasion.

COMPRESSION OF THE BRAIN. (See *Head, Injuries of*.)

CONCUSSION. (from *concutio*, to shake together.) *Concussio*. A concussion, or shock.

CONCUSSION OF THE BRAIN.— (See *Head, Injuries of*.)

CONDUCTOR. (from *conduco*, to guide.) A surgical instrument for directing the knife in certain operations. It is more commonly called a *director*.

CONDYLOMA. (from *κονδυλος*, a tubercle, or knot.) A small very hard tumour. The term is generally applied to excrescences of this description about the anus. The practitioner may either destroy them with the lapis infernalis, tie their base with a ligature, so as to kill them, or remove them at once, with a knife: the first is generally the worst; the last the best and most speedy method.

CONGESTION. (from *congero*, to amass.) *Congestio*. A collection of pus, particularly one of the chronic kind.

CONGLUTINANTIA. (from *conglutino*, to glue together.) Such medicines as heal and unite parts,

CONIUM MACULATUM. Hemlock. (See *Cicuta*.)

CONSTIPATION. (from *constipo*, to crowd together.) *Constipatio*. Costiveness.

CONTRA-APERTURA. (from *contra*, against, and *aperio*, to open.) A counter-opening. An opening made opposite to one that already exists.

CONTRA-FISSURA. (from *contra*, against, and *fundo*, to cleave.) A crack in the skull opposite to the part on which the blow was given.

CONTUSED WOUNDS. See *Wounds*.

CONTUSION. (from *contundo*, to bruise.) *Contusio*. A bruise.

Slight bruises seldom meet with much attention; but when they are severe, very bad consequences may ensue, and these are the more likely to occur, when such cases are not taken proper care of.

In all severe bruises, besides the inflammation which the violence necessarily

occasions, there is an instantaneous extravasation, in consequence of the rupture of many of the small vessels of the part. In no other way can we account for those very considerable tumours, which often rise immediately after injuries of this nature. The black and blue appearance, instantly following many bruises, can only be explained by their being an actual effusion of blood from the small vessels, which have been ruptured. Even largish vessels are frequently burst in this manner, and very considerable collections of blood are the consequence. Blows on the head very often cause a large effusion of blood under the scalp. I have seen four or five ounces thus extravasated.

Besides the rupture of an infinite number of small vessels and extravasation, which attend all bruises, in a greater or less degree, the tone of the fibres and vessels which have suffered contusion, is considerably disordered. Nay, the violence may have been so great, that the parts are from the first deprived of vitality, and must slough.

Parts at some distance from such as are actually struck, may suffer greatly from the violence of the contusion. This effect is what the French have named a *contrecoup*.

The bad consequences of bruises are not invariably proportioned to the force which has operated; much depends on the nature and situation of the part. When a contusion takes place on a bone, which is thinly covered with soft parts, the latter always suffer very severely, in consequence of being pressed, at the time of the accident, between two hard bodies. Hence, bruises of the shin so frequently cause sloughing and troublesome sores. Contusions affecting the large joints are always serious cases; the inflammation occasioned is generally obstinate, and abscesses and other diseases, which may follow, are consequences truly enough to excite alarm.

In the treatment of bruises, the practitioner has three indications, which ought successively to claim his attention, in the progress of such cases.

The first is to prevent and diminish the inflammation, which, from the violence done, must be expected to arise. The bruised parts should be kept perfectly at rest, and be covered with linen, constantly wet with the *lotio aq. litharg. acet.* When there are muscles bruised, they are to be kept in a relaxed position, and never used.

If the bruise should have been very violent, it will be proper to apply leeches, and this repeatedly, and even, in some

cases, particularly, when joints are contused, to take blood from the arm. In every instance, the bowels should be kept well open with saline purgatives.

A second object in the cure of contusions, is to promote the absorption of the extravasated fluid by discutient applications. These may at once be employed in all ordinary contusions, not attended with too much violence; for then nothing is so beneficial as maintaining a continual evaporation from the bruised part, by means of the cold saturnine lotion, and, at the same time, repeatedly applying leeches. In common bruises, however, the *lotio ammoniæ muriatæ* (see this article) is an excellent discutient application; but most surgeons are in the habit of ordering liniments for all ordinary contusions, and certainly they do so much good in accelerating the absorption of the extravasated blood, that the practice is highly praiseworthy. The *linimentum saponis*, or the *linimentum camphoræ*, are as good as any that can be employed. (See *Linimentum*.)

In many cases, unattended with any threatening appearances of inflammation, but in which there is a good deal of blood and fluid extravasated, bandages act very beneficially, by the remarkable power which they have of exciting the action of the lymphatics, by means of the pressure which they produce.

A third object in the treatment of contusions, is to restore the parts to their proper tone. Rubbing the parts with liniments has a good deal of effect in this way. But, notwithstanding such applications, it is often observed, that bruised parts continue for a long while weak, and even swell, and become œdematous, when the patient takes exercise, or allows them to hang down, as their functions in life may require. Pumping cold water two or three times a day, on a part thus circumstanced, is the very best measure which can be adopted. A bandage should also be worn, if the situation of the part will permit. These steps, together with perseverance in the use of liniments, and in exercise gradually increased, will soon bring every thing into its natural state again.

CORACOID PROCESS OF THE SCAPULA, FRACTURED. (See *Fracture. Fractures of the Scapula*.)

CORNEA TUNICA. (from *cornu*, a horn.) The anterior transparent convex part of the eye, which in texture is tough, like horn. It has a structure peculiar to itself, being composed of a number of concentric cellular lamellæ, in the cells of which is deposited a particular sort of fluid. It is covered externally by a con-

tinuation of the conjunctiva, which belongs to the class of mucous membranes; and it is lined by a membrane, the tunica humoris acquei, which seems to belong to the serous class.

FLESHY EXCRESCENCES OF THE CORNEA.

Mr. James Wardrop, in his *Essays on the Morbid Anatomy of the Human Eye*, has published an excellent chapter on this subject. Besides pterygia, which are treated of in another part of this Dictionary, Mr. Wardrop states, that the cornea is subject to two kinds of caruncles, or fleshy excrescences. One appears at birth, or soon after it, and resembles the *navi materni* so frequent on the skin of various parts of the body. The second is described, as having a greater analogy to the fungi, which grow from mucous surfaces, and being in general preceded by ulceration.

Of the congenital excrescence of the cornea, Mr. Wardrop has seen two remarkable instances. The first was in a girl, eight, or ten years of age, on whose left eye, there was a conical mass, the base of which grew from about two-thirds of the cornea, and a small portion of the adjoining sclerotic coat.

The second example occurred in a patient upwards of fifty years old. The tumour had been observed from birth, was about as large as a horse-bean, and only a small portion of it seemed to grow from the cornea. The other part was situated on the white of the eye, next the temporal angle of the orbit. From the middle of the excrescence, upwards, of twelve long firm hairs grew, and hung over the cheek.

Mr. Wardrop acquaints us, that a similar tumour, with two hairs growing out of it, was seen at Lisbon by Dr. Barron, of St. Andrews. Mr. Crampton also mentions, that he once saw a "tuft of very strong hairs proceeding from the sclerotica." (*Essay on the Eutropeon*, p. 7.) And De Gazelles met with an instance, in which a single hair grew from the cornea. (*Jour. de Médecine*, Tom. 24.) According to Mr. Wardrop, this species of excrescence of the cornea greatly resembles the spots, covered with hair, which are frequent on various parts of the surface of the body.

With regard to the second kind of tumour growing from the cornea, a fungus, proceeding from an ulcer of this part of the eye, is stated to be very uncommon. However, it is said, that, when a portion of the iris protrudes through an ulcer of the cornea, the growth of a large excrescence from the projecting part is not so

unusual. Of such a disease, Mr. Wardrop has cited an example from Maître Jan's *Traité des Maladies des yeux*. Voigtel, Beer, and Plaichner. Excrescences, growing from the cornea, are also quoted from the following works; *Handbuch der Pathologischen Anatomie*, Von F. G. Voigtel, Halle, 1804. *Pratische Beobachtungen über den grauen Staar und die Krankhieten der Hornhaut*, von Joseph Beer, Vienna, 1791. Plaichner's *Dissertation, de Fungo Oculi*. (See Wardrop's *Essays on the Morbid Anatomy of the Human Eye*, chap. 4.)

The only treatment, which excrescences of the cornea admit of, is to remove them with a scalpel and pair of forceps, or to destroy them with caustic.

ABSCESSSES OF THE CORNEA.

The following description of abscesses of the cornea is taken from Mr. Wardrop's valuable work on the morbid anatomy of the eye.

When the matter is collected between the lamellæ of the cornea, it first appears like a small spot; and, instead of resembling a speck in colour, it is of the yellow hue of common pus. As the quantity of the matter increases, this spot becomes broader, and it does not alter its situation from the position of the head. If it is situated among the external layers of the cornea, or immediately below the corneal conjunctiva, a tumour is formed anteriorly, and, if touched with the point of a probe, the contained fluid can be felt fluctuating within, or if the eye is looked at sideways, an alteration in the form of the cornea may be readily perceived.

When the matter collects, between the interior lamellæ, it does not produce any evident alteration, in the external form of the cornea; but, if it is touched with the point of a probe, a fluctuation can be more or less distinctly perceived, and the spot alters its form, and becomes somewhat broader.

Such collections of matter appear on every part of the cornea. Sometimes they alter their situation by degrees, and sink downwards; and sometimes they change both their situation and form. They very seldom cover more than one-fourth, or one-third of the cornea.

If the quantity of matter is small, it is often completely absorbed during the abatement of the inflammatory symptoms, and it generally leaves no vestige behind it. In other cases, the cornea is eroded externally, producing an ulcer, and subsequent opacity. In some few instances, the internal lamellæ of the cornea give way, and the matter escapes into the an-

terior chamber. If an artificial opening is made, in order to discharge the matter, it often does not readily flow out; and it is sometimes so tenacious, and contained in a cavity so irregular, that it neither escapes spontaneously, nor can it be evacuated by art.

It is particularly to the cases, in which matter collects between the layers of the cornea, that the terms *unguis*, and *onyx*, are applied. (See Wardrop's *Essays on the Morbid Anatomy of the Human Eye*, chap. 6.)

OPACITIES OF THE CORNEA.

Opacity of the cornea is one of the worst consequences of obstinate chronic ophthalmia. Scarpa distinguishes the superficial and recent species of opacity from the *albugo* and *leucoma*, (see these words,) which are not in general attended with inflammation, assume a clear pearl colour, affect the very substance of the cornea, and form a dense speck upon this coat of the eye. The *nebula*, or slight opacity, here to be treated of, is preceded and accompanied by chronic ophthalmia; it allows the iris and pupil to be discerned through a kind of cloudiness, and consequently does not entirely bereave the patient of vision, but permits him to distinguish objects, as it were, through a mist. The *nebula* is an effect of protracted or ill-treated chronic ophthalmia. The veins of the conjunctiva, much relaxed by the long continuance of the inflammation, become preternaturally turgid and prominent; afterwards they begin to appear irregular and knotty, first in their trunks, then in their ramifications, near the union of the cornea with the sclerotica, and lastly, in their most minute ramifications, returning from the delicate layer of the conjunctiva, spread over the cornea. It is only, however, in extreme relaxation of the veins of the conjunctiva, that these very small branches of the cornea become enlarged.

When this happens, some reddish streaks begin to be perceptible, in the interspaces of which, very soon afterwards, a thin milky albuminous fluid is effused, which dims the diaphanous state of the cornea. The whitish, delicate, superficial speck, thence resulting, forms precisely what is termed, *nebula*, or that kind of opacity here to be considered. And since this extravasation may happen only at one point of the cornea, or in more places, the opacity may be in one speck, or in several distinct ones, but which all together diminish, more or less, the transparency of this membrane.

The cloudiness of the cornea, which sometimes takes place in the inflammatory

stage of the violent acute ophthalmia, essentially differs from the species of opacity expressed by the term *nebula*. The first is a deep extravasation of coagulating lymph into the internal cellular texture of the cornea, or else the opacity proceeds from an abscess between the layers of this membrane about to end in ulceration. On the other hand, the *nebula* forms slowly upon the superficies of the cornea, in the long protracted chronic ophthalmia; is preceded first by a varicose enlargement of the veins in the conjunctiva, next of those in the delicate lamina of this tunic, continued over the front of the cornea; and finally it is followed by an effusion of albuminous lymph into the texture of this thin layer, expanded over the transparent part of the eye. This effusion never elevates itself in the shape of a pustule. Wherever the cornea is affected with this species of opacity, termed *nebula*, the part of the conjunctiva, corresponding to it, is constantly occupied by a network of varicose veins, more knotted and prominent than other vessels of the same description, and though the cornea be clouded at more points than one, there are distinct corresponding fasciculi of varicose veins in the white of the eye. Scarpa injected an eye affected with chronic ophthalmia, and *nebula*, and he found that the wax easily passed, both into the enlarged veins of the conjunctiva, and of that part of the surface of the cornea where the opacity existed; the inosculation all round the margin of the cornea were beautifully variegated, without trespassing that line, which bounds the sclerótica, except on that side, where the cornea was affected with this species of opacity.

This kind of opacity of the cornea, from its very origin, requires an efficacious plan of treatment; for though at first it may only occupy a small portion of the cornea, when left to itself it advances towards the centre of this membrane, and the ramifications of the dilated veins upon this coat growing still larger, at length convert the delicate continuation of the conjunctiva upon the surface of the cornea, into a dense opaque membrane, obstructing vision, either partially or totally.

The curative indication in this disease is to make the varicose vessels resume their natural diameters, or if that be impracticable, to cut off all communication between the trunk of the most prominent varicose veins of the conjunctiva, and the ramifications coming from the surface of the cornea, the seat of the opacity. The first mode of treatment is executed by means of topical astringents and corrobo-

rants, especially Janin's ophthalmic ointment, and success attends it, when the opacity is in an early state, and not extensive. But when advanced to the centre of the cornea, the most infallible treatment is the excision of the fasciculus of varicose veins near their ramifications, that is, near the seat of the opacity. By means of this excision, the blood retarded in the dilated veins of the cornea is voided; the varicose veins of the conjunctiva have an opportunity to contract and regain their tone, no longer having blood impelled into them; and the turbid secretion effused in the texture of the layer of the conjunctiva continued over the cornea, or in the cellular substance, connecting these two membranes, becomes absorbed. The celerity, with which the *nebula* disappears, after this operation, is surprising, commonly in twenty-four hours. The extent to which the excision of the varicose veins of the conjunctiva must be performed, depends upon the extent of the opacity of the cornea. Thus, should there be only one set of varicose vessels, corresponding to an opacity of moderate extent, it is sufficient to cut a portion of them away. Should there appear several dim specks upon the cornea, with as many distinct sets of varicose vessels, arranged round upon the white of the eye, the surgeon must make a circular incision into the conjunctiva, near the margin of the cornea, by which he will certainly divide every plexus of varicose vessels. But let it be observed, that a simple incision through the varicose vessels is not permanently effectual in destroying all direct communication between the trunks and ramifications of these vessels upon the cornea, after such an incision made, for instance, with a lancet; though it be true that a separation of the mouths of the divided vessels follows in opposite directions, it is no less true, that in the course of a few days after the incision, the mouths of the same vessels approximate each other, and inosculate, so as to resume their former continuity. Hence, to derive from this operation all possible advantage, it is essential to extirpate with the knife a small portion of the varicose plexus, together with the adherent particle of the tunica conjunctiva.

To do this operation properly, the plan of passing a needle threaded with silk through the varicose plexus is to be dispensed with. The eye-lids are to be separated from the affected eye by a skilful assistant, who is, at the same moment, to support the patient's head upon his breast. The surgeon is then to take hold of the varicose vessels, with a pair of small forceps, near the edge of the cornea,

and to lift them a little up, which the lax state of the conjunctiva renders easy; then, with a pair of small curved scissors, he is to cut away the plexus of varicose vessels, together with a small piece of the conjunctiva, making the wound of a semilunar form, and, as near as possible to the cornea. If it should be necessary to operate upon more than one plexus of varicose vessels, situated at some distance apart, the surgeon must elevate them one after the other with the forceps, and remove them. But when they are very close together, and occupy every side of the eye, he must make an uninterrupted circular incision into the conjunctiva, guiding it closely to the margin of the cornea all round, thus dividing with the conjunctiva, all the varicose vessels.

This being done, he may allow the cut vessels to bleed freely; even promoting the hemorrhage by fomenting the eyelids, until the blood discontinues to flow. Then the eye is to be covered with an oval piece of the emplastrum saponis, and a retentive bandage. The eye ought not to be opened till twenty-four hours after the operation, when, usually, the opacity of the cornea will be found completely dispersed; and, during the ensuing days, the patient is to be enjoined to keep the eye shut, and covered with a bit of fine rag. A collyrium of milk and rose-water warm, may be applied two or three times a day. It is worthy of observation, when the inflammation of the conjunctiva happens, about the second or third day after the operation, particularly in cases in which the incision is made all round, that while the greater part of the sphere of the eye reddens, a whitish circle, in the place of the incision, forms a line of boundary to the redness which does not extend further upon the cornea. This inflammation of the conjunctiva, with the aid of internal antiphlogistic remedies, and topical emollients, abates in a few days, and then pus is secreted along the track of the incision in the conjunctiva. The wound contracts, and growing smaller and smaller, soon cicatrizes. Bathing the eye with warm milk and rose-water is the only local treatment necessary in this state of the complaint.

This not only the transparency of the cornea is revived, but also the preternatural laxity of the conjunctiva is diminished, or even removed. When afterwards the conjunctiva appears yellowish and wrinkled, the use of topical astringents and corroborants, and of Janin's ophthalmic ointment, will yet prove highly beneficial, in preventing the recurrence of the varicose state of the vessels. (*Scarpa sulle malattie degli occhi.*)

For other opacities of the cornea refer particularly to *Albugo Leucoma* and *Staphyloma*.

ULCER OF THE CORNEA.

This is a very common consequence of the bursting of a small abscess, which not unfrequently forms beneath the delicate layer of the conjunctiva continued over the cornea, or in the very substance of the cornea itself, after violent ophthalmia. At other times, the ulcer of the cornea is produced by the contact of corroding matter, or sharp-pointed bodies insinuated into the eyes, such as quick lime, pieces of glass, or iron, thorns, &c. The little abscess of the cornea is attended with the same symptoms, as the severe acute ophthalmia; especially with a troublesome sensation of tension in the eye, eyebrow, and nape of the neck; with ardent heat; copious secretion of tears; aversion to light; intense redness of the conjunctiva, particularly near the point of suppuration. The inflammatory pustule, compared with similar ones in any other part of the body, is slow in bursting after matter is formed. Experience has nevertheless evinced, that it is improper to puncture the small abscess; for, though it assumes the appearance of being perfectly matured, the matter contained in it, is so tenacious, and adherent to the substance of the cornea, that not a particle issues out of the artificial aperture, and the wound exasperates the disease, increases the opacity of the cornea, and often occasions another small abscess to form in the vicinity of the first. The safest plan, in this case, is to temporize, until the pustule spontaneously bursts, promoting it by means of frequent fomentations, bathing the eye with warm milk and water, and applying emollient poultices. The spontaneous bursting of the little abscess is usually denoted by a sudden increase of all the symptoms of ophthalmia; particularly by an intolerable burning pain at the point of the cornea, where the abscess first began, greatly increased by motion of the eye, or eyelid. The event is confirmed by ocular inspection, and at the spot where the white pustule existed, a cavity appears, as may best be seen, when the eye is viewed in the profile. Extraneous bodies in the eye, which have simply divided a part of the cornea, or lodged in it, when soon extracted, do not in general cause ulceration, as the injured part heals by the first intention. Those which destroy, or burn the surface of this membrane, or

which, when lodged, are not soon extracted, excite acute ophthalmia, suppuration at the injured part, and at length ulceration.

The ulcer of the cornea has this, in common with all solutions of continuity in the skin, where it is delicate, tense, and endowed with exquisite sensibility, that, at its first appearance, it is of a pale ash-colour; has its edges high, and irregular; creates sharp pain; discharges, instead of pus, an acrid serum, and tends to spread widely and deeply. Such is the precise character of ulcers upon the cornea, and such is that of those upon the nipples of the mammæ; the glans penis; lips; apex of the tongue; the tarsi; the entrance of the meatus auditorius externus; nostrils; &c. Ulcers of this description, neglected, or ill-treated, speedily enlarge, make their way deeply, and destroy the parts in which they are situated. If they spread superficially upon the cornea, the transparency of this membrane is destroyed; if they proceed deeply, and penetrate the anterior chamber of the aqueous humour, this fluid escapes, and a fistula of the cornea may ensue; and if it should form a larger opening in it, besides the exit of the aqueous humour, it occasions another more grievous malady than the ulcer itself, namely, a prolapsus of a portion of the iris; an escape of the crystalline lens and vitreous humour, in short, a total destruction of the whole organ of sight. This afflicting accident is not unfrequent, in consequence of acute ophthalmia from gonorrhea, when neither internal nor external means avail, to arrest the progress of ulceration. It is therefore of the highest importance, as soon as an ulcer appears upon the cornea, to impede its growing larger, as much as the nature of it will permit; the morbid process should be converted into a healing one, and the surgeon must exert his skill with more attention, the more extensive and deep the ulceration has proceeded. The cicatrix of a large ulcer impairs the texture of the cornea so much, that the injury is irreparable.

They, who inculcate, that no external application can be adopted with benefit, for the cure of this disease, before the acute ophthalmia has been subdued, or, at least, diminished, are, in Scarpa's opinion, deceived. Experience teaches, that local remedies ought, in the very first instance, to be applied to the ulcer, such as are appropriate to lessen the increased morbid irritability, and stop the destructive process going on; afterwards such means should be taken, as will cure the ophthalmia, if it does not subside

gradually, as the ulcer heals. It is a fact, confirmed by repeated observation, that it is the ulcer which keeps up the ophthalmia, not the ophthalmia the ulcer. The case, however, is to be excepted, in which the ulcer makes its appearance in the height of a severe ophthalmia. Here the first indication is to abate inflammation, before attempting to heal the sore.

On opening the little abscess of the cornea, it is true, the symptoms of acute ophthalmia become aggravated; the redness of the conjunctiva is increased, as well as the turgid state of its vessels; but it is equally certain, that it happens from no other cause, than an increased inflammation in the part, in consequence of the augmented sensibility in the ulcerated spot of the cornea. As soon as this increase of sensibility in the ulcer of the cornea ceases, or abates, in violence, the ophthalmia retreats with equal speed, and, finally, when the ulcer heals, the inflammation vanishes gradually, or, at most, requires only the use of an astringent, and corroborant collyrium, for a few days. Analogous examples every day occur in practice, in ulcers of other parts, besides the cornea; particularly in little foul ulcers on the inside of the lips, on the apex of the tongue, on the nipples, on the glans penis, which, as was described above, at their first appearance, assume an ash-coloured surface, excite inflammation of the part in which they are seated, and cause a very troublesome itching and ardent heat in the part affected. To subdue this inflammation, we do nothing more, and the vulgar do the same, than repel the excessive irritability in these ulcers, and convert the ulcerative process into cicatrization. This done, the surrounding inflammation immediately disappears of itself.

The resource of art, productive of such speedy and such good effects, in these cases, is the caustic. It immediately destroys the naked extremities of the nerves in the ulcerated part, and soon removes that diseased irritability prevalent in the part affected; it converts the ash-coloured surface of the ulcer, and the serous discharge upon it, into an eschar and scab, which, as a kind of epidermis, moderates the contact of the neighbouring parts upon the ulcer, and, at length, converts the process of ulceration into that of granulation and cicatrization.

For cauterizing the ulcer of the cornea, the caustic to which Scarpa gives the preference, is the *argentum nitratum*. It must be scraped to a point, like a crayon pencil, and the eyelids being opened perfectly, and the upper eye-lid

suspended, by means of Pellier's elevator, the ulcer of the cornea is to be touched with the apex sufficiently to form an eschar. Should any of the caustic dissolve in the tears, the eye must be copiously bathed with warm milk. At the instant the caustic is applied, the patient complains of a most acute pain; but this aggravation is amply compensated, by the ease experienced a few minutes after the operation: the burning heat in the eye ceases, as it were by a charm; the eye and eyelids become capable of motion without pain; the flux of tears and the turgidity of the vessels of the conjunctiva decrease; the patient can bear a moderate light, and enjoys repose. These advantages last while the eschar adheres to the cornea.

On the separation of the eschar sometimes at the end of two, three, or four days after the application of the caustic, the primary symptoms of the disease recur, especially the smarting and burning pain at the ulcerated part of the cornea; the effusion of tears; the restraint in moving the eye and eyelids; and the aversion to light; but all these inconveniences are less in degree than before. At their recurrence, the surgeon, without delay, must renew the application of the *argentum nitratum*, making a good eschar, as at first, upon the whole surface of the ulcer, which will, as before, be followed by perfect ease in the eye. The application of the caustic is, if required, to be repeated a third time, that is, if upon the separation of the eschar, the extreme irritability in the ulcer is not exhausted, and its progressive mischief checked. When the case goes on favourably, it is a constant phenomenon in the cure of this disease, that, at every separation of the eschar, the diseased sensibility of the eye is decreased, the ulcer also, abandoning its pale ash-colour, assumes a delicate fleshy tint, a certain sign that the destructive process which prevailed, is turning into a healing one. The turgid state of the vessels of the conjunctiva, and the degree of ophthalmia, disappears, in proportion as the nicer draws near to a cure. At this epoch, when the formation of granulations has begun, the surgeon would act very wrongly, did he continue longer the use of the *argentum nitratum*; it would now reproduce pain, effusion of tears, and inflammation in the eye; and the ulcer would take on that foul ash-coloured aspect, with swelled and irregular edges, which it had in the beginning. Plater has noticed this fact. *Necesse est, ut hoc temperata manu, nec crebrius fiat, ne nova*

inflammatio, novaque lachryma hic acrioribus concitetur. Inst. Chirurg. § 314. As soon as ease is felt in the eye, and granulations begin to rise, whether after the first, second, or third application of the caustic, the surgeon must refrain from the use of every strong caustic, and use no other application than the vitriolic collyrium. *℞ Zinci Vitriol gr. iv. in Aq. Rosæ ℥iv cum ℥ss mucil. Sem. Cydon, mali M.* To be used every two hours, defending the eye, in the intervals, from the contact of the air and light, by means of a slight compress, and retentive bandage. In cases in which, besides the ulcer of the cornea, a slight relaxation of the conjunctiva remains, Janin's ointment, towards the end of the treatment, introduced between the eye and eyelids, morning and evening, proves extremely serviceable. It must be qualified in strength and quantity to the particular sensibility of the patient.

To cure those superficial excoriations of the cornea, which make no incavation in the substance of this membrane, and which, in reality, are only a detachment of the cuticle, covering the layer of the conjunctiva continued over the cornea, the use of caustic is not requisite. The above vitriolic collyrium, combined with the mucilage, is sufficient. The symptoms which accompany such slight excoriations, or detachments of the cuticle, are unimportant, and when the patient takes care to bathe his eye, every two or three hours, with the solution of vitriol, and to avoid too much light, and the impression of the atmosphere, they soon get well.

Thus far of the ulcer of the cornea, and the best mode of curing it in ordinary cases. However, sometimes, in consequence of ill-treatment, the ulcer, already very extensive, assumes the form of a fungous excrescence upon the cornea, appearing to derive its nourishment from a band of blood-vessels of the conjunctiva; and, on this account, it occasions, not unfrequently, a serious mistake in being taken for a real pterygium. Left to itself, or treated with slight astringents, it produces, in general, a loss of the whole eye. It requires the speedy adoption of some active and efficacious plan, to destroy all the fungus upon the cornea, to annihilate the vessels of the conjunctiva tending to it, and to impede the progress of ulceration. This consists first in cutting away the fungus, with a pair of small scissors, to a level with the cornea, continuing the incision far enough upon the conjunctiva, to remove, with the excrescence, that string of blood-vessels, from which it seems to derive its supply.

Having effected this, and allowed the blood to flow freely, it is proper to apply the argenteum nitratum to all the space of the cornea, which appears to have been the seat of the fungus, so as to make a complete eschar; and if, upon its separation, the whole morbid surface should not be destroyed, the caustic must be repeated, until the ulcerative process changes into a healing one. To execute commodiously such a full application of the caustic, it is not in general enough to have the upper eye-lid raised by an assistant, and the lower one depressed; it is also further requisite, that the operator, by means of a spatula, introduced between the upper eye-lid and the eyeball, should hold the same elevated with his own left hand, while, with the right, he applies the caustic, so as to form a strong deep eschar.

It must be acknowledged, the action of the caustic cannot always be calculated with precision, and therefore a portion of the whole thickness of the cornea may be destroyed with the fungus, which never fails to be followed by a prolapsus of part of the iris, through the aperture made in the cornea. This accident may seem to some very grievous; it is, however, not irreparable, as shall be shewn in the article *Iris, prolapsus of*; and when the surgeon can produce a firm cicatrix at the point, where the excrescence was situated, which resists a reproduction of the fungus, and a total destruction of the eye, he has fulfilled the indications required. (*Scarpa, sulle Malattie degli Occhi.*)

OSSIFICATION OF THE CORNEA.

Mr. Wardrop has seen only one instance of ossification of the cornea; and, in that case, the whole eye was changed in its form, and the cornea had become opaque. On macerating the latter part, a piece of bone, weighing two grains, oval shaped, hard, and with a smooth surface, was found between its lamellæ. A piece of bone was also found between the choroid coat and retina of the same eye.

The same gentleman informs us, that Walter had, in his museum, a piece of cornea, taken from a man sixty years of age, and containing a bony mass, which was three lines long, two broad, and weighed two grains.

In Mr. Wardrop's publication, there is also recorded a curious case, in which a portion of bone was formed, either in the substance of the cornea, or immediately behind it, and which was extracted from the eye by Mr. Anderson, surgeon at Inverary. The patient was a woman

thirty-one years of age, and the formation of the bony substance, which was about half as large as a sixpence, is said to have been occasioned by a fall against the root of a tree, fifteen years before the operation, by which accident the eye was struck, though not cut. (See *Wardrop's Essays, on the Morbid Anatomy of the Human Eye, Chap. 10.*)

ALTERATION IN THE FORM OF THE CORNEA.

This is the last subject which I shall take notice of in the present article. It is well known, that the convexity of the cornea varies in different persons, and in the same individual at different periods of life, this part of the eye being naturally most convex in young subjects. It appears, also, from the experiments of the late Mr. Ramsden, and those of Mr. Home, that the sphericity of the cornea is altered according to the distance, at which objects are viewed.

Sometimes the cornea projects, or collapses, so considerably, without its transparency being affected, that sight is much impaired, or quite destroyed. The first case has been called by some authors, the *Staphyloma pellucidum*; the second *Rhytidosis*.

Levéillé, the French translator of Scarpa's book on the diseases of the eye, has described a case, in which the cornea of both eyes became of a conical form. Mr. Wardrop has met with two examples of a similar disease; but only one eye was affected in each of them. In both cases, the conical figure of the cornea was very remarkable, and the apex of the cone was in the centre of the cornea. When the eye was viewed laterally, the apex resembled a piece of solid crystal, and when looked at directly opposite, it had a transparent sparkling appearance, which prevented the pupil and iris from being distinctly seen.

One of these cases occurred in a lady upwards of thirty years of age, and the changes, produced in her vision, were very remarkable. At the distance of an inch, or an inch and a half, she could plainly distinguish small objects, when held towards the temporal angle of the eye, although it required considerable exertion; but, the sphere of vision was very limited.

On looking through a small hole in a card, she could distinguish objects held very close to the eye, and could even read a book.

At any distance greater, than two inches, vision was very indistinct, and, at a few feet, she could neither judge of the distance, nor the form of the object.

When she looked at a distant luminous body, such as a candle, it was multiplied five or six times, and all the images were more or less indistinct. She could never find any glass sufficiently concave to assist her vision. She did not remark this complaint in her eye, until she was about sixteen years of age, and she does not think, it has undergone any change since that time.

In Mr. Wardrop's publication may be read a letter from Dr. Brewster, giving an explanation of the phenomena of the foregoing case.

It appears, that Mr. Phipps has had opportunities of watching the progress of several cases, in which the cornea had become conical, and that he never saw the disease in persons under the age of fourteen, or sixteen. The same gentleman also observes, that when the cone is once complete, the disease seldom makes any further progress, except that the apex sometimes becomes opaque.

Burgman saw a remarkable case, where the cornea of both the eyes of a person, who was hanged were so prodigiously extended, that they reached down to the mouth, like two horns. (*Haller, Disputationes Chirurg. Tom. 2.*) The chapter by Mr. Wardrop on the preceding subject will be found highly interesting to such as are desirous of further information concerning this curious disease of the eye. (See *Wardrop's Essays on the Morbid Anatomy of the Eye, Chap. 13.*)

CORNS, (*Clavi, Spinæ Pedum, Calli, Condylomata, &c.*) A corn, technically called *clavus*, from its fancied resemblance to the head of a nail, is a brawn-like hardness of the skin, with a kind of root sometimes extending deeply into the subjacent cellular substance. When this is the case, the indurated part is fixed; but while the hardness is more superficial, it is quite moveable. Some corns rise up above the level of the skin, in the manner of a flat wart. They are hard, dry, and insensible, just like the thickened cuticle, which forms on the soles of the feet, or on the hands of labouring people.

Corns are entirely owing to repeated and long-continued pressure. Hence, they are most frequent in such situations as are most exposed to pressure, and where the skin is near bones, as on the toes, soles of the feet, &c. However, corns have occasionally been seen over the crista of the ilium, from the pressure of stays, and even on the ears, from the pressure of heavy ear-rings.

Corns of the feet are usually owing to wearing tight shoes, and, consequently, they are more common in the higher classes, and in women, than other subjects.

In females, indeed, the ridiculous fashion of wearing high-heeled shoes, was very conducive to this affliction; for, certainly, it merits the appellation. In shoes thus made, the whole weight of the body falls principally on the toes, which become quite wedged, and dreadfully compressed in the end of the shoes.

Though some persons, who have corns, suffer very little, others occasionally endure such torture from them, that they are quite incapable of standing or walking. Doubtless the great pain proceeds from the irritation of the hard corn on the tender cutis beneath, which is frequently very much inflamed, in consequence of the pressure. It is observed, that every thing which accelerates the motion of the blood, which heats the feet, which increases the pressure of the corn on the subjacent parts, or the determination of blood to the feet, or which promotes its accumulation in them, exasperates the pain. Hence, the bad effects of warm stockings, tight shoes, exercise, long standing, drinking, &c. The pain in warm weather is always much more annoying than in winter.

If a person merely seeks temporary relief, it may be obtained by pulling off his tight shoes, sitting down, placing his feet in a horizontal posture, and becoming a little cool, the prominent portion of the corn should be cut off, as far as it can be done, without exciting pain, or bleeding, and the feet should be bathed in warm water.

The radical cure essentially requires the avoidance of all the above causes, and, particularly, of much walking, or standing. Wide, soft shoes, should be worn. Such means are not only requisite for a radical cure, but they alone very often effect it. How many women become spontaneously free from corns in child-bed, and other confinements? Though the radical cure is so easy, few obtain it, because their perseverance ceases as soon as they experience the wished-for relief.

When business, or other circumstances, prevent the patient from adopting this plan, and oblige him to walk or stand a good deal, still, it is possible to remove all pressure from the corn. For this purpose from 8 to 12 pieces of linen, smeared with an emollient ointment, and having an aperture cut in the middle, exactly adapted to the size of the corn, are to be laid over each other, and so applied to the foot, that the corn is to lie in the opening, in such a manner, that it cannot be touched by the shoe, or stocking. When the plaster has been applied some weeks, the corn commonly disappears, without any other means. Should the corn be in the sole of the foot, it is only necessary

to put in the shoe a felt sole wherein a hole has been cut corresponding to the situation, size, and figure, of the induration.

A corn may also be certainly, permanently, and speedily eradicated, by the following method, especially when the plaster, and felt-sole with a hole in it, are employed at the same time. The corn is to be rubbed twice a day with an emollient ointment, such as that of marshmallows; or with the volatile liniment, which is still better; and in the interim, is to be covered with a softening plaster. Every morning and evening, the foot is to be put for half an hour in warm water, and whilst there, the corn is to be well rubbed with soap. Afterwards, all the soft, white, pulpy outside of the corn, is to be scraped off with a blunt knife; but, the scraping is to be left off, the moment the patient begins to complain of pain from it. The same treatment is to be persisted in, without interruption, until the corn is totally extirpated, which is generally effected in eight or twelve days. If left off sooner, the corn grows again.

A multitude of other remedies for curing corns are recommended. They all possess, more or less, an emollient and discutient property. The principal are green wax, soap, mercurial, and hemlock plasters, a piece of green oil-skin, &c. They are to be applied to the corn, and renewed as often as necessary. An infallible composition consists of two ounces of gum ammoniacum, the same quantity of yellow wax, and six drams of verdigrease. In a fortnight, if the corn yet remain, a fresh plaster is to be applied.

It is frequently difficult, and hazardous to cut out a corn. The whole must be completely taken away, or else it grows again; and the more frequently it is partially cut away, the quicker is its growth rendered. When the skin is moveable, and, consequently, the corn not adherent to the subjacent parts, its excision may be performed with facility and safety, but, not without pain. But, in the opposite case, either leaving a piece of the corn behind, or wounding the parts beneath, can seldom be avoided. The latter circumstance may excite serious mischief.

A person, entirely cured of corns, is sure to be affected with them again, unless the above mentioned causes be carefully avoided. Some subjects are, indeed, more or less, disposed to have the complaint. There are persons, who for life wear tight shoes, and take no care of their feet, and, yet, are never incommoded with corns. On the contrary, others are constantly troubled with them, though they pay attention to themselves. Many are for a

time vexed with corns, and then become quite free from them, though they continue to wear the same kind of shoes and stockings.

The above account is chiefly taken from *Richter's Anfangsgründe der Wundarzneikunst. Band. 1.*

CORONOID PROCESS OF THE JAW; CORONOID PROCESS OF THE ULNA. For fractures of these parts, turn to *Fracture—Fractures of the Lower Jaw—Fractures of the Ulna.*

CORROBORANTS Strengthening medicines, or applications.

CORTEX PERUVIANUS. (See *Cinchona.*)

COUCHING. The depression of the cataract, or the introducing of an instrument into the eye, for the purpose of pressing the opaque crystalline lens downward, out of the axis of sight. (See *Cataract.*)

COUVRE-CHEF. The name of some bandages. See *Bandage.*

COXARIUS MORBUS. The ischias, or disease of the hip. See *Joints.*

COXENDIX. (from *coxa*, the hip.) The ischium; the hip-joint. For an account of the disease of the hip-joint, see *Joints.*

CRANIUM. (quasi *καρανιον*, from *καρα*, the head.) The skull. For an account of its fractures, see *Head, Injuries of.*

CREMOR LITHARGYRI ACETATI.

℞ Cremoris lactis ʒj.

Aq. litharg. acet. ʒj. M.

Employed by Kirkland in ophthalmics, and other inflammations.

CREPITATION. This term is often applied to the crackling noise, made in cases of emphysema, when the air is passing from one part of the cellular membrane into another.

CREPITUS. (from *crepo*, to make a noise.) This term is applied by surgeons to the grating sensation, occasioned by the ends of a fracture, when they are moved, and rubbed against each other. A crepitus is one of the most positive symptoms of the existence of such an accident.

CRYPsor'CHIS. A concealment of the testis within the abdominal ring.

CRYSTALLINE LENS. (from *κρυσταλλος*, crystal.) See *Cataract.*

CUPRUM VITRIOLATUM. (*Sulphate of Copper*) is an escharotic, and an ingredient in several astringent fluid applications, lotions for ulcers, collyria for the eyes, and injections for the urethra.

CURVATURE OF THE SPINE. See *Vertebrae, Disease of.*

CUTANEOUS NERVES OF THE

ARM. The effects supposed to arise occasionally from these nerves being wounded in venesection, are spoken of in the article, *Bleeding*.

CYSTIDES. (from *κυσίς*, a bag.) Encysted tumours. (see *Tumours, Encysted*.)

CYSTITIS. (from *κυσίς*, the bladder.) Inflammation of the bladder.

CYSTITOME. (from *κυσίς*, and *τεμνω*, to cut.) An instrument made on the same principle as the pharyngotomus, and intended to open the capsule of the crystalline lens. This name should more properly be applied to an instrument for cutting the bladder; but, *M. de la Faye*, who invented the cystitome, has rather ungrammatically chosen its name, and it will now probably continue for ever as it is. The sheath of the instrument conceals a little lancet, which is capable of darting out to the distance of one, two, or three lines, by means of a small spring, contained in the body of the instrument. In describing the modern plan of extracting the cataract, we have mentioned, that

a gold needle is recommended by Baron Wenzel and Mr. Ware for puncturing the capsule of the crystalline lens. The cystitome is certainly not a bad instrument, and it might still be useful, in cases, in which the iris is very irritable, and disposed to contract in an unusual degree. It is now, however, never employed. (See *Encyclopédie Méthodique, Partie Chirurg.*)

CYSTOCELE. (from *κυσίς*, the bladder, and *κηλη* a tumour.) A hernia, formed by a protrusion of the bladder. (See *Hernia*.)

CYSTOTOMIA. (from *κυσίς*, the bladder, and *τεμνω* to cut.) Making an opening into the bladder, for the extraction of a stone or calculus. (See *Lithotomy*.)

CUPPING. (See *Bleeding*.)

CURETTE. (French.) A very small instrument, shaped like a spoon, or scoop, and used by operators, who extract the cataract, for taking away any opaque matter, which may remain behind the pupil, immediately after the crystalline has been taken out.

D.

DACRYOMA. (from *δακρυω*, to weep.) An impervious state of one, or both the puncta lachrymalia, causing an effusion of tears.

DARSIS. (from *δερω*, to excoriate.) An excoriation.

DAUCUS. The carrot is used in surgery for making a poultice, which is often applied to malignant and spreading ulcers. (See *Cataplasma Dauci*.)

DEASCIATIO. (from *de*, and *ascio*, to cut with a hatchet.) A kind of fracture, in which a piece of bone is, as it were, chipped off.

DECOCTUM CHAMÆMELI. ℞ Flo-
rum Chamæmeli ℥ss. Aquæ Distillatæ lbj.
Boil ten minutes, and strain the liquor.
This answers very well as a common fo-
mentation. (See *Fomentum*.)

DECOCTUM DULCAMARÆ. ℞ Dul-
camaræ Caulis Concisæ unciam, Aquæ
Octarium cum Semisse. Decoque ad oc-
tarium, et cola.

The decoction of bittersweet is recom-
mended for some cutaneous diseases, pro-
ceeding from scrofula, lepra, and lues ve-
nerea.

DECOCTUM HELLEBORI ALBI. (Now
the *Decoction Veratri*.) ℞ Pulveris Radi-
cis Hellebori Albi ℥j. Aquæ Distillatæ

lbij. Spiritus Vinosi Rectificati ℥ij. Boil
the water and powder, till only half the
fluid remains, and, when cold, add the
spirit.

This is used as a lotion for curing the
itch, tinea capitis, and some herpetic af-
fections.

DECOCTUM LOBELIÆ. (*Blue Car-
dinal Flower of Virginia*.) ℞ Radicis Lo-
beliæ Syphiliticæ Siccæ Manip j. Aquæ
Distillatæ lb. xii. This is to be boiled
till only four quarts remain. The lobelia
gained repute as an antivenereal, though
little reliance is now put in it. The pa-
tient is at first to take half a pint twice,
and afterwards four times a day. It
operates, however, as a purgative, and the
doses must be regulated according as the
bowels appear to bear them.

DECOCTUM MEZEREI. ℞ Corticis
Radicis Mezerei Recentis ℥ij. Radicis
Glycyrrhizæ Contusæ ℥j. Aquæ Distillatæ
lbij. Boil the mezereon in the water,
till only two pints remain; and, when the
boiling is nearly finished, add the liquo-
rice root.

The decoction of mezereon has been
much prescribed for venereal nodes and
nocturnal pains, in doses of from four to
eight ounces, three times a day.

DECOCTUM PAPAVERIS. R Papaveris Somniferi Capsularum Concisarum $\mathfrak{z}\text{ij}$. Aquæ lbiv. Boil for a quarter of an hour and strain.

This decoction is used as a fomenting fluid in cases attended with great pain and inflammation.

DECOCTUM QUERCUS. R Quercus Corticis $\mathfrak{z}\text{j}$. Aquæ lbij. Boil down to a pint, and strain the fluid.

This decoction forms a very astringent injection, which is sometimes used for stopping gleans from the vagina. It also makes a lotion, which is of considerable use in cases of prolapsus ani. It may be applied to some slight rheumatic white swellings, which it will sometimes cure, particularly, when some alum is put into it.

DECOCTUM SARSAPARILLÆ. R Sarsaparillæ Radicis Concisæ $\mathfrak{z}\text{iv}$. Aquæ Ferventis lbiv. The sarsaparilla is to be macerated for four hours, near the fire, in a vessel lightly closed. The root is then to be taken out, bruised, and put into the fluid again. The maceration is to be continued two hours longer, after which the liquor is to be boiled till only two pints remains. Lastly it is to be strained.

DECOCTUM SARSAPARILLÆ COMPOSITUM. R Decocti Sarsaparillæ ferventis lbiv. SassafRAS Radicis Concisæ, Guaiaci Ligni Rasi, Glycyrrhizæ Radicis Contusæ, Singulorum $\mathfrak{z}\text{j}$. Mezerei Radicis Corticis $\mathfrak{z}\text{ij}$.

These are to be boiled together for a quarter of an hour, and then strained.

This, and the preceding decoction of sarsaparilla, are much prescribed by surgeons in cases of venereal nodes and pains; but, while some surgeons hold these medicines in high repute, in such cases, others entertain an opposite opinion of them. It is common, also, to exhibit these decoctions in several cutaneous diseases, and in scrofula.

The simple decoction is frequently directed for the restoration of the constitution after a course of mercury, being often given mixed with an equal quantity of milk.

The common dose of both the decoctions is from four to eight ounces, three times a day.

The compound one possesses similar qualities to those of the famous Lisbon Diet Drink, and is now generally prescribed instead of it.

DECOCTUM ULMI. R Ulmi Corticis Recentis Contus $\mathfrak{z}\text{iv}$. Aquæ lbiv. Boil to two pints, and then strain the liquor.

The decoction of elm bark is commonly prescribed in some herpetic diseases of the skin. Its operation is frequently promoted by giving with it the hydrargyri submuriæ.

DECOCTUM VERATRI. See *Decoctum Hellebori Albi*.

DECOLLATIO. (from *decollo*, to behead.) The having a part of the skull taken away with the scalp, in a wound of the head.

DECUSSORIUM. (from *decusso*, to divide.) An instrument to depress the dura mater after trepanning.

DEFENSIVE. An epithet given by surgical authors to such applications as defend parts.

DEFERENTIA VASA. In the article, *Hernia Humoralis*, the opinion of Mr. Hunter is related, that it is possible for the vas deferens sometimes to be rendered permanently impervious, in consequence of the inflammation of the testis being communicated to it.

In speaking of *Castration*, I have taken pains to reprobate the plan of including the vas deferens in the ligature, with which the spermatic cord is tied.

DEFLUXION. (from *defluo*, to flow down.) *Defluxio*. A falling down of humours from a superior to an inferior part. Many writers mean nothing more by it, than inflammation.

DELIGATIO. (from *deligo*, to bind up) The application of bandages.

DENTISCA'LPIUM. An instrument for scraping the tartareous matter off the teeth. Oribasius denotes by this word an instrument for separating the gums from the teeth.

DENTITION. The process, by which the teeth make their way through the gums.

DENTODUCUM, or DENTIDUCUM. An instrument for drawing the teeth.

DEOBSSTRUENTS. Medicines thought to have the power of removing obstructions. However, in the modern state of medicine, the doctrine of obstructions being the cause of many diseases is rejected as irrational and unfounded.

DEPASCENS ULCUS. A phagedenic ulcer.

DEPETIGO. (from *de*, and *petigo*, a running scab.) A ring-worm, or tetter.

DEPRESSION. (from *deprimo*, to press down.) *Depressio*. This word in surgery means the sinking inwards of some part of the skull, in consequence of external violence. In this manner pressure is often made on the brain, and, hence, it frequently becomes necessary to raise the depressed portion of bone with an elevator, or to take it away altogether, with a trephine, or one of Mr. Hey's saws. (See *Head, Injuries of*)

DEPRESSION OF THE CATARACT. The operation of couching, or removing the opaque crystalline lens out of the axis of vision, by pressing it downward into the vitreous humour with a particular kind of needle. (See *Cataract*.)

DEPRESSORIUM. (from *deprimo*, to press down.) An instrument for depressing the dura mater after trepanning.

DERIVATION A term often met with in old medical and surgical books, and in some modern ones. It means the attraction of humours from one place to another, where, they are discharged. Thus when a blister was put on the nape of the neck for the relief of a disease of the eye, the *modus operandi* was explained on the principle of derivation. In all the best schools, the old doctrine of derivation is now exploded. Counter-irritation is the principle, on which the moderns commonly explain what the old writers used to refer to *derivation*.

DESICCATIVES. Drying, or healing applications.

DESQUAMATIO. (from *desquamo*, to scale off.) The separation of scales of bone. Exfoliation.

DESQUAMATORIUM. (from *desquamo*.) An instrument for taking out a piece of the skull. A trephine, or trepan.

DETERGENT. Medicines fancied to have the quality of cleansing wounds. The conversion of a foul sore to one of clean appearance is effected by the action of the blood vessels and absorbents of the ulcerated surface, and, if any application deserve the appellation of a detergent, it is only because it excites this salutary action.

DETERMINATION. When the blood flows into one part more rapidly and copiously, than it does into others, or than is natural, it is said, in the language of surgery, that there is a *determination* of blood to such part.

DEUSTIO. (from *deuro*, to burn.) The scar of a scald, or burn.

DIÆRESIS. (from *διαίρεω*, to divide.) A division of substance; a solution of continuity. This was formerly a sort of generic term, applied to every part of surgery, by which the continuity of parts was divided.

DIAGNOSIS. (from *διαγνώσκειν*, to distinguish.) The discrimination, or forming a judgment of a disease, from its symptoms.

DIAPHORETICS. Medicines, which promote perspiration.

DIAPLASIS. The reduction of a fracture, or dislocation.

DIAPYEMA. An abscess.

DIARRHAGE. A fracture, particularly of the os temporis.

DIARRHŒA. A frequent purging.

DIATHESIS. Any particular disposition of the body.

DIGESTION. (from *digero*, to dissolve.) *Digestio.* By the *digestion* of a wound, or ulcer, the old surgeons meant bringing it

into a state, in which it formed healthy pus.

DIGESTIVES. Applications, which promote this object.

DIGITUM. (from *digitus*, a finger.) The contraction of a finger-joint. A sore on the finger: a whitlow.

DILATORIUM. (from *dilato*, to enlarge.) A surgical instrument for dilating any part.

DILUENTS. Medicines which are supposed to increase the fluidity of the blood, and some of the secretions.

DIOPTRA. (from *διοπτραι*, to see through.) An instrument, with which any cavity was dilated, and inspected.

DIORTHOSIS. (from *διορθώνω*, to direct.) One of the ancient divisions of surgery: it signifies the restoration of parts to their proper situations.

DIPLOPIA. (*Visus duplicatus*.) This is one of the most unusual diseases of the eyes, and it is of two kinds. For instance, the patient either sees an object double, treble, &c. only when he is looking at it with both his eyes, and, no sooner is one eye shut, than the object is seen single and right; or, else, he sees every object double, whether he surveys it with one, or both his eyes. The disorder is observed to affect persons in different degrees. Patients seldom see the two appearances, which objects present with equal distinctness; but, generally, discern one much more plainly and perfectly, than the other. The first distinct shape, which strikes the eye, is commonly that of the real object, while the second is indistinct, false, and visionary. Therefore, patients, labouring under this affection, seldom make a mistake, but, almost always know which is the true and real object. However there are cases, in which the patient sees the two appearances, which things assume, with equal clearness, so that he is incapable of distinguishing the real object from that, which is false and only imaginary.

The disorder is sometimes transitory and of short duration, and may be brought on in a healthy eye by some accidental cause, which is generally some irritation affecting the organ. Sometimes, the complaint is continual; sometimes periodical. In some instances, the patient only sees objects double, when he has been straining his sight for a considerable time, as, for example, when he has been reading a small print for a long while by candle-light. In this case, the disorder becomes lessened by shutting the eyes for a few moments. There are also instances, in which the objects only have a double appearance at a particular distance, and not, either when they are nearer, or fur-

ther off. Sometimes, the patient sees objects double only upon one side; as, for example, when he turns his eyes to the right hand, while nothing of this sort is experienced in looking in any other direction. In certain cases, objects appear double, let the eyes be turned and directed in any way whatsoever.

The causes of double vision may be divided into four classes. Namely, the object, which the patient looks at, may be represented double upon the retina, which is the effect of the first class of causes. Or, the object may be depicted in one eye differently from what it is in the other, in regard to size, position, distance, clearness, &c.; this is the effect of the second class of causes. Or, the object may appear to one eye to be in a different place from that which it seems to the other to occupy: the effect of the third class of causes. Or, lastly, the sensibility of the optic nerves is defective, so that the image of an object, though it may appear single to one eye as well as the other, yet, in one identical situation will seem double to both of them. When the complaint originates from causes of the first and fourth class, the patient sees things double, whether he is using only one, or both eyes; but, when it proceeds from the second and third class of causes, the patient only sees objects double, when he is looking at them with both eyes, and, no sooner does he shut one than objects put on their natural, single appearance.

The following are the chief causes of the first class of a single object being depicted upon the retina as if double. 1. An unevenness of the cornea, which is divided into two, or more convex surfaces. There are cases, which shew, that such an uneven shape may actually be the cause of double vision. (*Haller, Element. Physiol. Tom. 5, p. 85*) However, it must not be dissembled, that there is a far greater number of instances, in which such unevenness of the cornea, though equally considerable, does not occasion this defect of sight. We have principally an opportunity of observing cases of this sort after the operation of extracting the cataract. From these circumstances, it would seem, that the inequalities must be of a very particular shape to produce double vision. The diagnosis of this cause is easy enough; but, the removal of it is impracticable; for, how is it possible to restore the original shape of the cornea? 2. An inequality of the anterior surface of the crystalline lens, whereby the same is divided into several distinct surfaces, it is suggested, may also be the occasion of diplopia. Such an ine-

quality may possibly produce the disorder; but, it is exceedingly doubtful, whether any case of this sort has ever been met with, and, as Richter properly remarks, the investigation is not worth undertaking, as the diagnosis and cure would be equally impracticable. The only possible method of cure would be the extraction, or depression, of the crystalline lens; yet, with the uncertainty respecting the nature of the cause, what man would be justified in performing an operation, in which the patient is not wholly exempt from the danger of losing his sight altogether? A double aperture in the iris, or as the case is termed, a double pupil, has been enumerated as a cause of diplopia. However, as Richter observes, the reality of such a cause is doubtful, for, cases have been noticed, where double vision was not the effect of there being two openings in the iris. (*Janin Mém. sur l'Oeil.*) But, were the disorder actually to originate in this way, it would not admit of a cure.

The causes of the second class, by the effect of which the object is represented, in regard to its size, position, distance, &c. differently in one eye from what it is in the other, are for the most part rather possible, than such as have been actually observed. The causes, which make objects assume an appearance contrary to the real one may sometimes be confined to one eye, to which things are depicted diversely from what they are to the other healthy eye, so that the patient sees, as it were, double. Thus, for example, there may be a stronger refraction of the rays of light on one eye, than the other; the patient may be a *myops* with one eye, and a *presbyops* with the other; and then the object will seem to one eye large, to the other small; to one eye distant, to the other plainly near. This state of the sight, indeed, is said to have occurred after operating upon a cataract in one eye. (*Ileuermann.*) However, that this is not a common consequence of operating upon a cataract in one eye, while the other is perfect, seems to be clearly evinced by several cases in Wenzel's treatise on the cataract, by some facts, which are related both by St. Yves and Maître-Jean, and by some observations, published in the Medical and Physical Journal, for May 1808. In consequence of a certain defect of the sight, objects, which are perpendicular, seem to the patient to have a sloping posture. When it is considered, that only one eye is thus affected, and that to this things will appear sloping, and to the other healthy one straight, double vision must be the effect. A few

remarks connected with this subject will be introduced hereafter. (See *Sight, Defects of.*)

When both eyes are so directed to an object, that it becomes situated in the axis of vision of each of these organs, such object is represented in both at the same place, that is, it is depicted upon that part of the retina, on which the axis of sight falls. Thus, the object seems to both eyes to be in the same place, and, though the two organs discern the thing, it only communicates a single appearance. But, when one eye is turned to any object in a different direction from that of the other; that is to say, when one eye is turned to an object in such a way, that the object is situated in the axis of vision of this eye, while the opposite eye is so turned, that the said object is placed on one side of its axis vision; in other words, when a person squints: the object is depicted in one eye upon a different part of the retina from what it is in the other; consequently, the object appears to the two respective organs to be differently situated, and the patient is affected with diplopia. This is the third species of this disorder, which arises from strabismus as a third kind of occasional cause. Such patients naturally only see objects double, when they behold them with both eyes.

A person, who squints, usually has one eye stronger than the other, and the weakness of one of these organs is the common cause of the strabismus. Such a person does not see objects double, because he only sees with one eye well, and with the other so faintly and imperfectly, that scarcely any impression is made. Hence, every case of strabismus is not necessarily combined with diplopia; indeed, the common kind of squinting is not joined with it. A person, affected with strabismus, only sees double, when the sight of each eye is equally strong, and when the squinting does not depend upon any weakness of one of the eyes, but, upon some other occasional causes. The principal causes of the latter sort are of a spasmodic nature: viz. an irritation affects some muscle of the eye in such a manner, that the patient is incapacitated from moving both his eyes according to his will, and from directing them to any object, so that such object may be at once in the axis of vision of both. Richter states, that, in the majority of cases, the irritation alluded to is seated in the gastric organs, though he thinks, that any other species of irritation may operate upon the eyes in a similar manner. This kind of diplopia is frequently attendant on other spasmodic diseases as a symp-

tom. It often accompanies hypochondriasis. Sometimes, it is the consequence of violent pain. Richter informs us of a man, who saw double and squinted, during a severe headach. He states, that another was affected in the same way during a toothach. Sometimes, the diplopia is owing to a paralysis of one of the muscles of the eye; sometimes, to a tumour in the orbit. The diagnosis of this kind of diplopia is free from difficulty; the patient has been affected with squinting, ever since things have appeared double to him.

The fourth class of causes are such irritations as act upon the optic nerves, changing their sensibility in such a way, that objects do not make that sort of impression upon them, which they ought to do. Thus the patient sometimes sees things having the appearance of being coloured, when they are really not so; immoveable objects seem to him in motion; straight objects appear oblique, and in the cases, which we are now treating of, single things seem to the eye to be double, treble, &c. This faulty kind of sensibility may also be produced by irritation in eyes, which are perfectly sound; but, it is most readily occasioned in eyes, which are preternaturally weak and irritable. In these, very trivial and inconsiderable irritations will often excite it. In the treatment, the common indication is to discover and remove whatever irritation conduces to this effect; but, the attempt frequently fails. In very irritable eyes, the disorder is often brought on by very slight irritations, which cannot always be diminished, or removed. Here, the grand indication is to cure the weakness and irritability of the organs.

The fourth class of causes of diplopia are the principal and most frequent. The irritations giving rise to them, are of various kinds, and generally seated in the abdominal viscera. Diplopia is sometimes the consequence of inebriety, foulness of the stomach, intermitting fevers, hypochondriasis, worms, &c. However, the complaint is occasionally excited by other sorts of irritation. It has frequently followed a violent fright. It may be connected with spasmodic and painful diseases of several kinds. Severe headachs and toothachs are sometimes joined with this affection of the sight. Richter mentions a boy, who, being in the woods, was struck by the bough of a tree over the eye, and, in consequence of the accident, became affected with diplopia. He informs us of a man, who rode a journey on horseback along a snowy road on a very sunshiny day, and was affected in the same manner. I cannot believe with

this author, however, that stoppages of puffings and perspirations, and the driving inward of eruptions, have ever really been the cause of diplopia. This affection of the eyes is sometimes the effect of injuries of the head. Persons, who have weak eyes are apt to become double-sighted, whenever they attentively look for a long while at any light shining objects. Patients in fevers are also sometimes double-sighted.

The irritation, which is productive of diplopia, may lead to other serious complaints of the eye, when it operates with great violence. Indeed, it frequently happens, that diplopia terminates in some other disorder of the eyes, and it is often the forerunner of the worst diseases of these organs, particularly, the gutta serena. The difficulty, or ease of the cure partly depends upon the nature of the remote cause, and partly upon the condition of the eye. Some of the causes are easy, others difficult, of removal. When the eye is very weak and irritable, the disorder frequently continues, notwithstanding the irritation has been removed. Also, when the complaint is relieved, it is exceedingly difficult to prevent a relapse, for on very irritable eyes, slight irritations, which cannot be hindered, are apt to produce a return of the affection. Therefore, the indication is to remove the existing defect of sight, and take means for the prevention of its return, or the commencement of any other. The weakness and preternatural irritability of the eye should be removed, as well as every sort of irritation, things which are often very difficult of accomplishment.

The chief business of the surgeon, in the treatment of this kind of diplopia, consists in endeavouring to find out and remove the irritation occasioning the disorder. The majority of such irritations are of the same nature as those, which give rise to the gutta serena. (See *Amaurosis*.) Indeed, both the complaints are often only different effects of the same cause, and of course require a similar mode of treatment. The boy, whom Richter has mentioned, as having become double-sighted in consequence of being struck over the eye with the bough of a tree, was cured by the external use of the infusum radice valerianæ and spiritus vini crocatus, with which the eyelids and adjacent parts were rubbed several times a day. A diplopia, which followed a violent fright, has been cured by valerian, preceded by a few doses of cream of tartar. An hypochondriacal patient got rid of the disorder by means of the warm bath. A diplopia, which was supposed to arise from some disorder of the bile,

was cured by means of pills made of gum galbanum, guaiacum, rhubarb, and Venice soap, assisted with emetics and purgatives.

When the irritation, exciting the disorder, is only of temporary duration, as, for instance, looking at shining objects; when the disorder continues after the removal of the irritation; or, lastly, when the irritation cannot be well detected; the surgeon is to endeavour, by means of nervous and soothing medicines, rather to remove the impression, which the irritation has left upon the nerves; or to render the nerves insensible to the continuing irritation. Experience is loudly in favour of the following remedies for cases of diplopia: hartshorn, dropped in the hand, and held before the eyes open; the external use of the spiritus vini crocatus; warm bathing of the eye, particularly, in a decoction of white poppy heads; bathing the eye in cold collyria; the internal administration of bark, valerian, small doses of ipecacuanha, flowers of zinc, and oleum cajeputi. In one instance, in which it was impossible to detect the cause, Richter states, that soluble tartar with oxen's gall and castoreum was found of service; that, in another similar case, rhubarb, oxen's gall, and assa fœtida and, in a third, aqua ammoniæ acetatæ with oxen's gall, proved useful. This author further observes, that, in all cases, in which the particular cause of the disorder cannot be precisely determined, we may always conjecture, that such cause has its seat in the abdominal viscera; and that much benefit may often be derived from mild resolvents, evacuates, and anodyne medicines. (*Richter's Anfangsgrunde der Wundarzneikunst. Band 3. Kap. 15.*)

DIRECTOR. (from *dirigo*, to direct.) One of the most common instruments of surgery; it is long, narrow, grooved, and made of silver, in order that it may be bent into any desirable shape. Its use is to direct the knife, and protect the parts underneath from the edge or point of the latter instrument. The surgeon introduces the director under the parts, which he means to divide, and then either cuts down, along the groove of the instrument, with a common bistoury, or cuts upward with a narrow, curved, pointed bistoury, the point of which is turned upwards, which he carefully introduces along the groove of the director. This instrument and the crooked bistoury are commonly employed for opening sinuses, for cutting fistulæ in ano, and other situations, and, for dilating the stricture in cases of hernia.

DIS'CRIMEN. A bandage formerly used after bleeding in the forehead. It

is a narrow single-headed roller, which is held with the left thumb upon a compress, letting about a foot of the bandage hang below the forehead. The roller is carried round the temples, and occiput in a circular manner. The part, which hangs down, is then to be carried over the head to the occiput, and fastened.

DISCUTIENTS. Applications, which tend to disperse swellings, and extravasated fluids by promoting the action of the absorbents.

DISLOCATION. (from *disloco*, to put out of place.) *A Luxation.* When the articular surfaces of the bones are forced out of their proper situation, the accident is termed, a *dislocation* or *luxation*.

The most important differences of luxations are, 1. with respect to the articulation, in which these accidents take place; 2. the extent of the dislocation; 3. the direction, in which the bone is displaced; 4. the length of time the displacement has continued; 5. the circumstances, which accompany it, and which make the injury simple, or compound; 6. and, lastly, with respect to the causes of the accident.

1. The loose joints, which admit of motion in every direction, are those, in which dislocations occur most frequently: such is that of the humerus with the scapula. On the contrary, the ginglymoid joints, which only allow motion in two directions, are, comparatively speaking, seldom dislocated. The articular surfaces of the latter are of great extent, and, consequently, the heads of the bones must be pushed a great way in order to be completely dislocated; and the ligaments are numerous and strong.

2. With respect to the extent of the dislocation, luxations are either *complete*, or *incomplete*. The latter term is applied, when the articular surfaces still remain partially in contact. Incomplete dislocations only occur in ginglymoid articulations, as those of the foot, knee, and elbow. In these the luxation is almost always incomplete; and very great violence must have operated, when such joints are completely dislocated. In the orbicular articulations, the luxations are almost invariably complete.

3. In the orbicular joints, the head of the bone may be dislocated at any point of their circumference; the luxations, are named accordingly *upward*, *downward*, *forward*, and *backward*. In the ginglymoid articulations, the bones may either be dislocated laterally, or forward, or backward.

4. The length of time a dislocation has existed, makes a material difference. Recent dislocations may, in general, be

easily reduced; but, when the heads of the bones have been out of their places, for several days, the reduction becomes exceedingly difficult, and, in older cases, very often impossible. The soft parts, and the bone itself, have acquired a certain position; the muscles have adapted themselves in length to the altered situation of the bone, to which they are attached, and, sometimes, cannot be lengthened sufficiently to allow the bone to be reduced. In many instances, in the course of a short time, the opening in the capsular ligament, becomes closed, so that the head of the bone cannot return into its original situation. Lastly, the luxated bone may become adherent to the parts on which it has been forced.

5. The difference is immense, in regard to the danger of the case, arising from the circumstance of a dislocation being attended, or unattended, with a wound, communicating, internally with the joint, and externally with the air. When there is no wound of this kind, the danger is generally trivial, and the dislocation is termed a *simple one*: when there is such a wound, together with the dislocation, the case is denominated *compound*, and is frequently accompanied with the most imminent peril. Indeed, the latter kind of accident often renders amputation proper.

6. The causes of dislocations are external and internal. A predisposition to such accidents may depend on circumstances natural, or accidental. The great latitude of motion, which the joint admits of; the little extent of the articular surfaces; the looseness and tenuity of the ligaments; the lowness of one side of the articular cavity, as, at the anterior and inferior part of the acetabulum; and the shallowness of the cavity, as of that of the scapula; are natural predisposing causes to luxations.

A paralytic affection of the muscles, around the joint, and a looseness of its ligaments, are also predisposing causes. When the deltoid muscle has been paralytic, the mere weight of the arm has been known to cause such a lengthening of the capsular ligament of the shoulder-joint, that the head of the os brachii has descended two or three inches from the glenoid cavity.

The looseness of the ligaments sometimes makes the occurrence of dislocations so easy, that the slightest causes produce them. Some persons cannot yawn, or laugh, without running a risk of having their lower jaw luxated.

Such diseases, as destroy the cartilages, ligaments, and articular cavities, of the bones, may give rise to a dislocation,

The knee is sometimes, but not frequently, partially luxated in consequence of a white-swelling; the thigh is often dislocated in consequence of the acetabulum and ligaments being destroyed by what is commonly named the disease of the hip-joint. Such dislocations have been called *spontaneous*, as has been already observed.

An enarthrosis joint can only be dislocated by external violence, a blow, a fall, or the action of the muscles, when the axis of the bone is in a direction, more or less oblique, with respect to the surface, with which it is articulated.

Any external force may occasion a dislocation (generally incomplete) in the ginglymoid joints; but, in the ball and socket articulations, the action of the muscles is constantly concerned in producing such an accident. So, when a person falls on his elbow, while his arm is raised outwards from his side, the force, thus applied, will undoubtedly contribute very much to push the head of the os brachii out of the glenoid cavity, at the lower and internal part. Still, the sudden action of the pectoralis major, latissimus dorsi, and teres major, which always takes place from the alarm, will also aid in pulling downward and inward the head of the bone. The violent action of the muscles alone can, under certain circumstances, produce a dislocation, without the conjoint operation of any outward force.

Dislocations are constantly attended with more or less laceration of the ligaments; in such accidents of the shoulder and hip, the capsules are always torn.

SYMPTOMS OF DISLOCATIONS.

Pain, and inability of moving the limb, are only equivocal symptoms. In a dislocation of an orbicular joint, the limb must generally be either lengthened, as is the case, when the head of the thigh-bone is thrown downwards and inwards upon the obturator foramen; or else shortened, as is the case, when the same bone is luxated upwards and backwards.

The absence of such symptoms in luxations of the ginglymoid joints, however, is amply compensated by the superficial situation of the bones, which makes it easy to ascertain their relative situations.

The dislocations of the head of the bone, necessarily causes a change in the direction of the limb. So, when the os brachii is dislocated downwards and inwards, the arm, instead of hanging perpendicularly by the side, has its direction downwards and outwards. The bone being out of its natural situation, many

muscles, inserted into it, necessarily become stretched, and others, relaxed. In dislocations of the humerus, the deltoid may always be observed to be tense and stretched.

The eminences of a dislocated joint become changed in relation to each other. Projections occur, where there should be depressions; and depressions, where there should be projections. So, when the arm is dislocated downwards and inwards, the head of the os brachii causes a hard tumour in the hollow of the axilla, while the part of the shoulder, just below the acromion, which is naturally prominent, now presents a vacancy.

In short, the chief diagnostic signs of a dislocated joint principally consist of circumstances, arising from the functions of the affected joint being interrupted, and from the lodgment of the articular extremity of the bone in an unnatural situation, among parts, which it compresses, and renders painful. Hence, there is a loss of motion in the joint; the limb, or part, is either shortened, lengthened, or distorted to one side, or another; the pressure of the dislocated head of the bone on the surrounding parts causes considerable pain, which is immensely increased, when the surgeon attempts to move the limb, in order to examine the case. The head of the dislocated bone, may sometimes be distinctly felt, forming a preternatural tumour, or projection, while in the situation of the articular cavity, there is an unusual depression, or want of fullness.

A dislocation is termed *complete*, when the surfaces of the joint are not at all in contact; *incomplete*, when they partially touch each other; *simple*, when the accident is unattended with an external wound leading into the capsular ligament; *compound*, when such a wound also exists; *recent*, when the injury has only just occurred, or not existed long enough for any difficulty in the reduction to be occasioned by the proper treatment having been delayed; *ancient*, when the bones have been displaced a sufficient length of time for such difficulty to arise. Dislocations have also been divided into such as are *accidental*, (of which I shall particularly treat in the present article) and, into others, which are termed *spontaneous*, and arise from disease of the articulations. Of these last cases, notice will be taken under the head of *Joints, Diseases of*, especially in the section concerning the disease of the hip-joint, sometimes named ischias.

Dislocations are also sometimes, attended with particular symptoms, arising altogether from the pressure caused by

the head of the luxated bone on certain parts. The sternal end of the clavicle has been known to compress the trachea, and impede respiration: the head of the humerus may press upon the axillary plexus of nerves, and produce a paralytic affection of the whole arm.

As Kirkland has observed, there are some luxations, which are far worse injuries than fractures; of this description are, dislocations of the vertebræ; cases, which are almost always fatal; dislocations of the long bones, with protrusion of their heads through the muscles and skin, and attended with severe inflammation, gangrene, tetanus, extensive abscesses, and subsequent caries; causes, which frequently exhaust the patient, and occasion death, as the practice of every man of experience must have convinced him.

PROGNOSIS.

Dislocations of enarthrosis joints are generally much less dangerous, than those of ginglymoid ones. The action of the muscles has a great share in producing the former; the violence done to the external parts is less; and the laceration of the soft parts is not so considerable.—Even, in the same kind of joints, the seriousness of the case depends on the largeness of the articular surfaces, and the number and strength of the muscles and ligaments.

Dislocations of ginglymoid joints, however, are more easily reduced, than those of enarthrosis articulations, the muscles of which are frequently very powerful, and capable of making great resistance to the efforts of the surgeon. This is often exceedingly obvious in luxations of the shoulder, and thigh.

Dislocations from *disease*, termed *spontaneous*, cannot admit of reduction: when this accident happens in the hip-disease, it is not merely in consequence of the ligaments being destroyed, the brim of the acetabulum itself is often annihilated.

TREATMENT OF DISLOCATIONS IN GENERAL.

We shall first introduce the valuable remarks of Mr. Pott upon this part of the subject, and then add such others, as seem entitled to attention. Mr. Pott says, that the principle, concerning the extended or relaxed, that is, the resistant or non-resistant state of the muscles, as depending on the position of the limb, may be applied with equal truth and equal advantage to dislocations: as to fractures. Neither of them can indeed be rightly understood, or judiciously treated, with-

out such consideration. In both, a perfect knowledge of the disposition, force, attachments and uses of the muscles, at least those of the limbs, are indispensably necessary.

Mr. Pott observes: By what our forefathers have said on the subject of luxations, and by the descriptions and figures which they have left us of the means they used, of what they call their organs and machinemata, it is plain that force was their object, and that whatever purposes were aimed at or executed, by these instruments or machines, were aimed at and executed principally by violence.

Many, or most of them indeed, (says Mr. Pott) are much more calculated to pull a man's joints asunder, than to set them to rights. Hardly any of them are so contrived as to execute the purpose for which they should be used, in a manner most adapted to the nature or mechanism of the parts on which they are to operate. The force or power of some of the instruments is not always determinable, as to degree, by the operator, and consequently may do too little or too much, according to different circumstances in the case, or more or less caution or rashness in the surgeon.

Many of these instruments are now laid aside, and some few have been so altered, as to become useful; but before Mr. Pott, the same kind of principle, on which these instruments were originally founded and constructed, very generally prevailed, and violence was used, to the great fatigue, pain, and inconvenience of the patient in many cases, in which dexterity joined to a knowledge of the parts, would have executed the same purpose with facility and ease.

In dislocations, as in fractures, says Pott, our great attention ought to be paid to the muscles belonging to the part affected. These are the moving powers, and by these the joints, as well as other moveable parts, are put into action; while the parts to be moved are in right order and disposition, their actions will be regular and just, and generally determinable by the will of the agent, (at least in what are called voluntary motions;) but when the said parts are disturbed from that order and disposition, the action or power of the muscles does not therefore cease; far from it, they still continue to exert themselves occasionally; but instead of producing regular motions, at the will of the agent, they pull and distort the parts they are attached to, and which by being displaced cannot perform the functions for which they were designed.

“Hence principally, (says this author)

arise the trouble and difficulty which attend the reduction of luxated joints. The mere bones composing the articulations, or the mere connecting ligaments, would in general afford very little opposition; and the replacing the dislocation would require very little trouble or force, was it not for the resistance of the muscles and tendons attached to and connected with them: for by examining the fresh joints of the human body, we shall find that they not only are all moved by muscles and tendons, but also, that although what are called the ligaments of the joints do really connect and hold them together, in such manner as could not well be executed without them, yet in many instances, they are, when stript of all connection, so very weak and lax, and so dilatable and distractile, that they do little more than connect the bones and retain the synovia; and that the strength, as well as the motion of the joints, depends in great measure on the muscles and tendons connected with and passing over them; and this in those articulations which are designed for the greatest quantity, as well as the celerity of motion. Hence it must follow, that as the figure, mobility, action, and strength of the principal joints, depend so much more on the muscles and tendons in connection with them, than on their mere ligaments; that the former are the parts which require our first and greatest regard, these being the parts which will necessarily oppose us in our attempts for reduction, and whose resistance must be either eluded or overcome; terms of very different import, and which every practitioner ought to be well apprised of."

Mr. Pott lays great stress on the necessity of examining the joints in the recent subject, not merely those of the skeleton, in order to understand the subject of dislocations.

The following are principles laid down by this author.

1. Although a joint may have been luxated by means of considerable violence, it does by no means follow, that the same degree of violence is necessary for its reduction.

2. When a joint has been luxated, at least one of the bones of which it is composed is detained in that unnatural situation by the action of some of the muscular parts in connection with it; which action, by the immobility of the joint, becomes as it were, tonic, and is not under the direction of the will of the patient.

3. That the mere bursal ligaments of some of the joints, endued with great mobility, are weak, distractile, and con-

stantly moistened; that for these reasons they are capable of suffering considerable violence without being lacerated; but that they are also sometimes most certainly torn.

4. That, did the laceration of the said ligaments happen much more frequently than Mr. Pott believes it does, yet it cannot be a matter of very great consequence, as it neither totally prevents reduction, when timely and properly attempted, nor a consequent cure. The difficulty of reduction arising from this circumstance will be noticed again, when we speak of dislocations of the shoulder.

5. That supposing such accident to be frequent, yet as it is impossible to know, with any kind of certainty, whether it has happened or not, or in what part of the ligaments, it cannot be admitted as a rule for our conduct, nor ought such mere conjecture to produce any deviation from what we ought to do, were there no such supposition. Could we know with certainty when and where this had happened, very useful information might indeed be drawn from it.

6. That all the force used in reducing a luxated bone, be it more or less, be it by hands, towels, ligatures or machines, ought always to be applied to the other extremity of the said bone, and as much as possible to that only. Some eminent surgeons have disputed this maxim, especially, in France.

In every joint capable of dislocation, the same circumstance, which renders it liable to be displaced, is also a very considerable assistance in its reduction. Mr. Pott means the dilatability or distractile power of the ligaments, or their capacity of giving way when stretched or pulled at.

This is perhaps the strongest argument which can be produced, why all the force made use of in reducing a dislocated joint should be applied to that bone only, and not to the next. By the yielding nature of the ligaments of the luxated joint, reduction is to be accomplished. The ligaments of the other articulation, which is not luxated, are yielding also; and all the force which is applied to the bone below or adjoining, must, necessarily be lost in the articulation which is not luxated, and can be of little or no service in that which is. This remark, though made by Pott, and generally received as true, is very incorrect; for, it tends to state, that if you pull at the ankle, or wrist, the force does not operate on the hip, or shoulder.

"Let this principle (says Pott) be applied to the dislocation of the joint of the shoulder, and it will shew us why the arm, in which the whole arm is tied down, and subjected to the extending power of

the said instrument, is defective, and may be pernicious. Why instruments built on the same general principle, but in which the fore arm is not fastened down, but left at liberty and not subjected to the ligature, execute their purpose with a great deal less force. Why the vulgar but frequently very successful method of reducing this joint, by placing the operator's heel in the axilla of the supine patient, sometimes fails, the surgeon not having proper assistance, and contenting himself with pulling at the patient's wrist only. It will also shew us, why, in the case of a luxated os femoris at the joint of the hip, the strength of five or six people divided between the joint of the knee and that of the ankle, shall be insufficient; and that of four, nay three of the same assistants, shall in the same case prove sufficient, by being all, and properly applied to the knee and femur only."

Mr. Pott's next principle is, 7. That in the reduction of such joints, as are composed of a round head, received into a socket, such as those of the shoulder and hip, the whole body should be kept as steady as possible, for the same reason as in the foregoing.

8. That in order to make use of an extending force with all possible advantage, and to excite thereby the least pain and inconvenience, it is necessary that all parts serving to the motion of the dislocated joint, or in any degree connected with it, be put into such a state as to give the smallest possible degree of resistance.

This, Mr. Pott considers as the first and great principle by which a surgeon ought to regulate his conduct in reducing luxations. This, says he, will shew us why a knowledge of all the muscular and tendinous part, acting upon, or in connection with the articulations, is absolutely necessary for him who would do his business scientifically, with satisfaction to himself, or with ease to his patient. It will shew us, that the mere position of the limb below the luxated joint, is what must either relax or make tense the parts in connection with that joint, and consequently that posture is more than half of the business. It will shew us, why sometimes the luxated os humeri slips in, as it were, of its own accord, by merely changing the position of the arm, when very violent attempts, previous to this, have proved successful. It will shew us, why extending the arm in a straight line horizontally, or so as to make a right angle with the body, must in some instances render all moderate attempts fruitless. Why the method of attempting reduction by the heel in the axilla is so often successful, notwithstanding two very consi-

derable disadvantages under which it labours, viz. part of the force being lost in the elbow, and the tense state of one head of the biceps cubiti. Why the tying down the fore-arm in the common ambi is wrong, for the same reasons. Why the fore-arm should at all times (let the method of reduction be what it may) be bent, viz. because of the resistance of the long head of the biceps in an extended posture. Why, when the os humeri is luxated forward, or so that its head lies under the great pectoral muscle, the carrying the extended arm backward, so as to put that muscle on the stretch, renders the reduction very difficult, and why, on the contrary, the bringing the arm forward, so as to relax the said muscle, removes that difficulty, and renders reduction easy. Why the reduction of a luxated elbow should always be attempted by bending the said joint. Why, when the inner ankle is dislocated in consequence of a fracture of the fibula, it is extremely difficult at all times, and sometimes impracticable, either to reduce or to keep reduced the said joint, while the leg is in an extended posture; and why a bent posture of the leg enables us with ease to accomplish both these ends. Why the case of dislocation of the head of the os femoris, (be it in what manner it may) a straight position of the leg and thigh will always increase the difficulty of reduction; and why that very distorted and bent position, in which the patient will always place it for his own ease, is and must be the posture most favourable for reduction; because it is and must be that posture in which the muscles, most likely to make opposition, are most relaxed and rendered least capable of resistance.

9. That in the reduction of such joints as consist of a round head, moving in an acetabulum or socket, no attempt ought to be made for replacing the said head, until it has by extension been brought forth from the place where it is, and nearly to a level with the said socket.

This will shew us, continues Mr. Pott, another fault in the common ambi, and why that kind of ambi, which Mr. Freke called his commander, is a much better instrument than any of them, or indeed than all; because it is a lever joined to an extensor; and that capable of being used with the arm, in such position as to require the least extension, and to admit the most; besides which it is graduated, and therefore perfectly under the dominion of the operator.

It will shew us, says Pott, why the old method by the door or ladder, sometimes produced a fracture of the neck of the scapula; as he has seen it do himself.

Why if a sufficient degree of extension be not made, the towel over the surgeon's shoulder, and under the patient's axilla, must prove an impediment rather than an assistance, by thrusting the head of the humerus under the neck of the scapula, instead of directing it into its socket.

Why the bar, or rolling-pin, under the axilla produces the same effect.

Why the common method of bending the arm (that is, the os humeri) downward, before sufficient extension has been made, prevents the very thing aimed at; by pushing the head of the bone under the scapula, which the continuation of the extension for a few seconds only would have carried into its proper place.

"I know it is said, observes Mr. Pott, that mere extension only draws the head of the bone out from the axilla, in which it was lodged, but does not replace it in the acetabulum scapulæ. To which I will venture to answer, that when the head of the os humeri is drawn forth from the axilla, and brought to a level with the cup of the scapula, it must be a very great and very unnecessary addition of extending force, that will or can keep it from going into it. All that the surgeon has to do, is to bring it to such level: the muscles attached to the bone will do the rest for him, and that whether he will or not.

Indeed, continues this author, if all the rational means and methods for reducing a luxated shoulder be examined, they will be found to act upon this principle, however differently this matter may appear to those who have not attended to it. Even the common ambi succeeds by means of the extension, which the carrying the arm down with it produces, and not by its lever. That part of the instrument, so far from helping, is often a considerable hindrance, and even sometimes frustrates the operator's intention, by pushing the head of the bone against the scapula, before it is sufficiently drawn out from the axilla.

10. The last of Pott's principles is, that whatever kind of degree of force may be found necessary for the reduction of a luxated joint, that such force be employed gradually; that the lesser degree be always first tried, and that it be increased gradatim.

Whoever, says Pott, reflects on what is intended by extension, what the parts are which resist, and how that resistance may be best overcome, will want little argument to induce him to accede to this principle; the advantages deducible from attending to it, and the disadvantages which may and do follow the neglect of it, are so obvious.

They who have not made the experi-

ment, will not believe to how great a degree a gradually increased extension may be carried without any injury to the parts extended; whereas great force, exerted hastily, is productive of very terrible and very lasting mischief.

Mr. Pott concludes with expressing his disapprobation of, what was termed, the *vis percussivæ*. (See *Remarks on Fractures and Dislocations*.)

Dislocations in general require some trouble to be reduced; but they are easily kept so. Fractures, on the contrary, are generally easily reduced, but kept so with difficulty.

The extending force has been recommended to be applied by all the ancient writers to the luxated bone; for instance, to be applied above the knee in dislocations of the thigh-bone, and above the elbow in those of the humerus. We have stated, that Pott advised this plan, and the same practice is approved by J. L. Petit, Duverney, and Callisen, and adopted almost generally in our own country.

However, many of the best modern surgeons in France, for instance, Fabre, D'Apouy, Desault, Boyer, Richerand, and Levéillé, have advised the extending force not to be applied on the luxated bone, but, on that, with which it is articulated, and as far as possible from it. It is said, that this plan has two most important advantages: first, the muscles, which surround the dislocated bone, are not compressed, nor stimulated to spasmodic contractions, which would resist the reduction; secondly, the extending force is much more considerable, than in the other mode; for, by using a long lever, we obtain a greater degree of power.

In Pott's remarks, we find even him influenced by the prevailing prejudice against the above practice, that part of the extending force is lost on the joint, intervening between the dislocation, and the part, at which the extension is made. This notion is quite unfounded, as every man, who reflects for one moment, must soon perceive. When extension is made at the wrist, the ligaments, muscles, &c. which connect the bones of the fore-arm with the os brachii, have the whole of the extending force operating on them, and they must obviously transmit the same degree of extension, which they receive, to the bone above, to which they are attached. This matter, indeed, seems so plain, that I think it would be an insult to the reader's understanding to say any more about it, than that such eminent surgeons, as have contrary sentiments, can never have taken the trouble to reflect for themselves on this particular subject. Whether

the force necessary to be exerted in some instances, might not have a bad effect on the intervening joint, I cannot pretend to say; but, as Desault's practice was very extensive, and he did not find any objection of this kind, we have, perhaps, no right to conclude, that such a one would exist.

Extension may either be made by means of assistants, who are to take hold of napkins, or sheets, put round the part, at which it is judged proper to make the extension; or else a multiplied pulley may be used. In general, the first plan is preferred. Nothing more need be added to what Mr. Pott has stated, concerning the propriety of using moderate force in the first instance, and increasing the extending power very gradually.

The extension should always be first made in the same direction, into which the dislocated bone is thrown; but, in proportion as the muscles yield, the bone is to be gradually brought back into its natural position. Thus the head of the bone becomes disengaged from the parts, among which it has been placed, and brought back to the cavity, which it has left, by making it describe the same course, which it took in escaping from it.

The extension will prove quite unavailing, unless the bone, with which the dislocated head is naturally articulated, be kept motionless by counter-extension, or a force at least equal to the other, but, made in a contrary direction.

The mode of fixing the scapula and pelvis, in luxations of the shoulder and thigh, will be described in speaking of dislocations of the arm and thigh.

In dislocations of ginglymoid joints, extension and counter-extension are only made, for the purpose of diminishing the friction of the surfaces of the joints, so as to be enabled to put them in their natural situation.

When the attempts at reduction fail, the want of success is sometimes owing to the extension not being powerful enough, and the great muscular strength of the patient, whose muscles counteract all the efforts to replace the bone.

In the latter case, the patient may be freely bled, and put into a warm bath, so as, if possible, to make him faint; hence the opening in the vein should be made large, because a sudden evacuation of blood is more likely to produce swooning, than a gradual discharge of it, and the patient, for the same reason, may be bled as he stands up. In very difficult cases, some authors have even recommended intoxication, which is certainly a very favourable opportunity for eluding the re-

sistance, made to reducing dislocations, in very powerful subjects.

[The practice of copious bleeding in cases of obstinate luxations was first employed in this city many years ago by Dr. Physick with the happiest effect. It has been since adopted by many practitioners and has proved a valuable remedy. Dr. Monro recommended it, in his lectures many years ago.]

However, long continued, unremitting, not too violent, extension, will at last overcome the muscles of the most athletic man, and such practice is the most entitled to praise.

Dislocations of orbicular joints can seldom be reduced, after a month, though Desault used to succeed, with great violence, at the end of three or four. Dislocations of ginglymoid ones are, in general, irreducible after twenty, or twenty-four days, in consequence of anchylosis having taken place.

The reduction of a dislocation is known by the limb recovering its natural length, shape, and direction, and being able to perform certain motions, not possible while the bone was out of its place. The patient experiences a great and sudden diminution of pain; and, very often, the head of the bone makes a noise at the moment, when it returns into the cavity of the joint.

In order to keep the bone from slipping out of its place again, we have only to hinder the limb from moving. When splints can act powerfully in steadying the joint, they are, however, very often used, as in dislocations of the ankle, wrist, &c. As the humerus cannot be luxated, except when at some distance from the body, a return of its dislocation will be prevented by confining the arm in a sling, in such a way, that it cannot be raised from the side of the trunk. The spica bandage, applied after such an accident, is more satisfactory to the patient, than really efficacious. Whatever bandage is used to keep the arm from moving, should be put on the other end of the bone, as far as possible from the centre of motion.

COMPOUND DISLOCATIONS.

Compound Dislocations, as we have said, are those, which are attended with a wound communicating with the cavities of the injured joints. These accidents, like compound fractures, are frequently attended with great danger; and the same nicety of judgment is requisite in determining, whether amputation ought to be immediately performed, or an effort made to preserve the limb, as in cases of compound fractures. What we shall state on

the latter subject, will, for the most part, be applicable to the present one.

The luxation of a large joint, being conjoined with an external wound, leading into the capsular ligament, is a circumstance, that has a particular tendency to increase the danger of the accident. In many cases, we see injuries of this description followed by violent and extensive inflammation, abscesses and mortification, fever, delirium, and death. When the patient is much advanced in years, is much debilitated, or of an unhealthy irritable constitution, compound luxations, especially, if attended with much contusion and other injury of the soft parts, and wrongly treated, very often have a fatal termination. This, however, is not the general event of compound dislocations, and whatever may have happened in former times, we now know, that, in the present improved state of surgery, these accidents mostly admit of cure. I would not, however, by any means insinuate censure against every instance of amputation performed in such cases. I know, that this operation is occasionally indispensable immediately after the accident, and I am equally aware, that it may become necessary in a future stage, when extensive abscesses, or sloughing, joined with threatening constitutional symptoms, have taken place. My only design is to recommend the endeavour to cure the generality of compound luxations. But, if a case were to present itself, attended with serious contusion and laceration of the soft parts, I should be as earnest an advocate for amputation as any surgeon whatsoever.

The treatment of a compound dislocation requires the reduction to be effected without delay, and with as little violence and disturbance as possible. The limb is then to be placed in splints, with the necessary pads, eighteen-tailed bandage, &c. The wound is to be freed from any dirt, clots of blood, or other extraneous matter, and its lips are to be accurately brought together with strips of adhesive plaster. The joint is to be covered with linen wet with the saturnine lotion; the bandage is to be loosely laid down, and the splints fastened on the limb with their proper straps, or pieces of tape, and the limb is to be kept perfectly at rest in an eligible posture. The patient, if strong and young, is to be bled. This last practice may be more freely adopted in the country, than in London, or large hospitals. Purging, however, must never be omitted, and an anodyne, the first night, or two, will be highly proper. Saline draughts, antimonials, and a low regimen, are also indicated during the first few days of the symp-

tomatic fever, which commonly follows so serious an accident.

If the case takes a favourable course, the constitutional fever will not be excessive, nor will the pain and inflammation of the limb be immoderate. Sometimes, the wound unites, more or less, without suppuration; a circumstance most particularly to be desired, as tending more than any thing else to lessen the danger, by changing the case, as it were, from a compound into a simple one. In other cases, the wound is not united; but, the inflammation and suppuration are not violent, nor extensive; the constitution is not dangerously disturbed; and hopes of ultimate success may be reasonably entertained. When the wound is disposed to heal favourably, lint and adhesive plaster, or a pledget of soft soap cerate, are the best dressings. In other instances, while the suppuration is copious, and the parts are tense and painful, emollient poultices are the most eligible applications.

When the symptomatic fever, and first inflammatory symptoms, are over, and much discharge prevails, attended with marks of approaching weakness, the patient is to be allowed more food, and be directed to take bark, cordials, porter, wine, &c. If his nights are restless, he must have opiates; if he sweats profusely, sulphuric acid; and, in short, all such medicines, as his particular complaints may require, are to be prescribed.

When the inflammation of a compound dislocation is violent, or extensive, general bleeding, the application of leeches, and the use of fomentations, and poultices, are the most likely means of lessening the mischief. Yet, it is only in strong habits, that venesection to any extent can be prudently practised in large cities, or crowded hospitals.

In certain examples, the most skilful treatment is unavailing. The joint and limb become affected with considerable pain and swelling; the fever runs high; delirium comes on; and the patient may even perish from the violence of the first symptoms, the limb being generally at the same time attacked with gangrene. If these first dangers are avoided, the wound may yet not heal favourably; the inflammation may be considerable, or of an erysipelatous nature; large abscesses under the fasciæ may be formed; the bones may become carious; and the hectic symptoms, and sinking state of the patient, may make the only chance of recovery depend upon amputation. But, even this operation is sometimes deferred till too late, and the patient must be left to his miserable fate.

Whoever gives the smallest reflection to the nature of compound fractures, will perceive, that it is often a matter of the last importance, to make a right decision at the very beginning, whether amputation should be immediately done, or whether an attempt to save the limb ought to be made. In some instances, the patient's sole chance depends upon the operation being performed at once, without the least delay, and the opportunity of doing it never returns. The surgeon should take off the limb as soon as he has seen the nature of the injury, and not wait, till a general tendency to swelling and gangrene has spread through the member, and every action of the system is disturbed. Amputation, under these circumstances, hardly ever succeeds, and the patient too frequently dies, before the mortification has ceased to spread, and any opportunity of removing the limb presents itself.

But, besides this first critical period, the surgeon often has to exercise a nice degree of judgment in a future stage of the case; I mean, when the suppuration is copious, the wound open, the bones carious, and the health impaired. Here the practitioner may sometimes err, in taking off a limb, that might be saved; or, he may commit a worse fault, and make the patient lose his life, in a fruitless attempt to save the member. No precepts can form the right practitioner in this delicate part of surgery; genius alone cannot do it; the opportunity of making observations, and the talent of profiting by them, are here the things, which make the consummate surgeon.

It should ever be recollected, in regard to bad compound dislocations, that in young subjects, and in a salubrious air, many cases will do well, which in old persons, and in the polluted atmosphere of London, and crowded hospitals, would be fatal without amputation.

There is a practice, in regard to compound dislocations, which appears to me to deserve universal condemnation; I mean the plan of sawing off the head of the luxated bone. According to M. Levéillé, this method is recommended by Hippocrates as a means of accelerating and perfecting the cure. (*Nouvelle Doctrine Chirurgicale*, Tom. 2, p. 44.) This extraordinary scheme, however, seems not to have done sufficient good, in ancient times, to obtain a lasting reputation. In fact, when it was mentioned by the late Mr. Gooch, it had sunk into such oblivion, that it was received as an entirely new proposal. "Compound luxations (says this author) are of a more dangerous nature, than compound fractures, for very plain reasons; but, if a surgeon should judge it advisa-

ble to attempt saving a limb under such threatening circumstances, I am inclined to think, from what I have observed, he will be more likely to succeed, by sawing off the head of the bone, especially if it has long been quite out and exposed to the air."

Mr. Gooch afterwards takes notice of a case, in which Mr. Cooper, of Bungay, sawed off the heads of the tibia and fibula, and preserved the limb, the patient being able to walk and work for his bread for many years afterwards. Other examples are also briefly mentioned, in which the lower head of the radius was sawn off, and the head of the second bone of the thumb.

Mr. Hey, of Leeds, has been induced to make trial of this plan in a compound luxation of the ankle. The example, however, which he has published, is decidedly highly unfavourable to the practice, as the following passage will shew: "I was in hopes, that the patient would have been able to walk stoutly; but, in this, I was disappointed. He walked indeed, without a crutch; but, his gait was slow, his leg remaining weak, and his toes turning outwards, which rather surprised me, as his leg, was very straight, when I ceased attending him."

Mr Hey tells us, that he has not recited this case, with the view of recommending a similar practice in all cases of this accident; for, he has not always adopted it; nor, is he of opinion, that the same mode of treatment, whether by replacing the bones, sawing off their extremities, or amputating the limb, ought to be universally practised. When the laceration of the capsular ligament and integuments is not greater, than is sufficient to permit the head of the tibia to pass through them; and when, at the same time, the joint, or contiguous parts, have suffered no other injury; Mr. Hey recommends the replacing of the bone, and an union of the integuments by suture, with the treatment adapted to wounds of the joints. (*Practical Observations in Surgery*, Chap. 11, Edit. 2.)

I am sorry, that this respectable surgeon's name may hereafter be brought forward in justification of a method, which appears to have nothing to recommend it, either in reason, or experience. That in two or three cases, recorded by this gentleman and Mr. Gooch, the patients recovered, with a new sort of joint, only proves to my mind, the great resources and activity of nature, and her occasional triumph over the opposition she meets with from bad and injudicious surgery. A limb, so treated, must ever afterwards be shorter, than its fellow, and consequently the patient be more or less a cripple.

ple. We have seen, that in the only instance, published by Mr. Hey, considerable deformity was the consequence of the practice. I cannot help adding my belief, that Mr. Hey would experience more success in the treatment of compound dislocations, if he were to relinquish the objectionable method of sewing up the wound. In such accidents, every kind of irritation should be avoided as much as possible, and that the wound may be conveniently closed with sticking plaster, the observation of numerous cases in St. Bartholomew's Hospital, has perfectly convinced me. In this munificent institution, under the disadvantage of the air of London and an hospital, compound luxations are treated with marked success, and I feel warranted in ascribing the circumstance to the mode of treatment, which is conducted on the principles explained in this section of the Dictionary.

PARTICULAR DISLOCATIONS.

Dislocations of the Lower Jaw.

The lower jaw can only be luxated forward, and either one, or both of its condyles may become displaced in this direction. Every dislocation, except the one forward, is rendered impossible by the formation of the parts. The lower jaw cannot even be dislocated forward, unless the mouth, just before the occurrence of the accident, be very much open. Whenever the chin is considerably depressed, the condyles slide from behind forward, under the transverse root of the zygomatic processes. The cartilaginous cap, which envelops the condyles, and follows them in all their motions, still affords them an articular cavity; but, the depression of the bone continuing, the ligaments give way, the condyles glide before the *eminentie articulares*, and slip under the zygomatic arches. Hence, a dislocation mostly happens, while the patient is laughing, gaping, &c. A blow on the jaw, when the mouth is wide open, may easily cause the accident. The case has occasionally arisen from the exercise of great force in drawing out the teeth. Whenever the jaw has once been dislocated, the same causes more easily reproduce the occurrence. In certain individuals, the ligaments are so loose, and the muscles so weak, that a dislocation is produced by any slight attempt to yawn, laugh, or (as Lamotte has observed) to bite any substance, which is rather large. (*Levéillé, Nouvelle Doctrine Chirurgicale, Tom 2, p. 54.*) There have been persons, who could scarcely ever laugh heartily, without having their lower jaws luxated, in consequence of so doing. But, of all

the causes of this occurrence, yawning alone, even without the combination of any external force, is by far the most common.

When the jaw is depressed, and its angles, to the external sides of which the masseters are attached, are carried upwards and backwards, if these muscles contract, the greater part of their force is employed to bring the condyles into the zygomatic depression. (*Boyer.*)

Dislocations of the lower jaw are attended with a great deal of pain, which Boyer imputes to the pressure produced by the condyles on the deep seated temporal nerves, and those going to the masseters, which nerves pass before the roots of the zygomatic process. The mouth is wide open, and cannot be shut. It is more open in recent dislocations, than in those which have continued for some time. An empty space is felt before the ear, in the natural situation of the condyles. The coronoid process forms under the cheek-bone a prominence, which may be felt through the cheek, or from within the mouth. The cheeks and temples are flattened by the lengthening of the temporal, masseter, and buccinator muscles. The saliva flows in large quantities from the mouth, the secretion of which fluid is greatly increased by the irritation of the air. The arch, formed by the teeth of the lower jaw, is situated more forward than that formed by the teeth of the upper jaw. The patient can neither speak nor swallow during the first days after the accident. (*Boyer.*) When only one condyle is dislocated, the mouth is distorted, and turned towards the opposite side, while the fellow teeth of the jaws do not correspond. Hey asserts, however, that the position of the chin is frequently not perceptibly altered. (*Practical Observations, p. 322.*)

The symptoms are not so well marked, when the accident has remained unreduced for several days or weeks. In such instances, the chin becomes gradually approximated to the upper jaw; the patient recovers by degrees the faculty of speaking and swallowing; but he stammers, and the saliva dribbles from his mouth. The sufferings induced by a dislocated jaw are certainly great enough to be sometimes fatal, if the case continue unrectified; but, we are not to believe Hippocrates, when he positively declares the accident mortal, if not reduced before the tenth day.

Monteggia attended a man, two months after such a luxation, which had not been understood, and Fabricius ab Aquapendente assures us, that he had never seen the prognostic of Hippocrates veri-

fied, though he had had many patients of this sort under his care. (*Levéillé, Nouvelle Doctrine Chirurgicale, Tom. 2, p. 58.*)

Dislocations of the lower jaw are to be reduced in the following manner: The surgeon is first to wrap some linen round his thumbs to keep them from being hurt by the patient's teeth, and then introduce them into the mouth, as far as possible on the grinding teeth. At the same time, he is to place his fingers under the chin and base of the jaw, and while he depresses the molares with his thumbs, he raises the chin with his fingers, by which means the condyles become disengaged from their situation under the zygomas; at which instant the muscles draw these parts so rapidly back into the articular cavities again, that the surgeon's thumbs would very probably be hurt, did he not immediately move them outward between the cheek and the jaw.

The reduction being accomplished, a recurrence of the accident is to be prevented by applying a four-tailed bandage, as recommended for the fractured jaw. The patient should for some time avoid eating food, which requires much mastication.

The ancients used to place two pieces of stick between the grinding teeth, and while they used these as levers to depress the back part of the bone, they raised the chin by means of a bandage. John de Vigo has described this method from Salicetus, Lanfranc, and Guido di Cauliaco; but, it is not preferable to the modern plan, in regard to efficacy; and it has the disadvantage of exposing the teeth to be broken by the sticks.

DISLOCATIONS OF THE VERTEBRÆ.

The large surfaces, with which these bones support each other; the number and thickness of their ligaments; the strength of their muscles; the little, which each vertebra naturally moves; and the vertical direction of their articular processes; make dislocations of the dorsal and lumbar vertebræ quite impossible, unless there be also a fracture of the processes just mentioned. Of these cases I shall only remark, that they can only result from immense violence; that the symptoms would be an irregularity in the disposition of the spinous processes, retention or incontinence of the urine and feces, paralysis and a motionless state of the lower extremities, the effects of the pressure, or other injury, to which the spinal marrow is subjected. Similar symptoms may also arise, when the spinal marrow has merely

undergone a very violent concussion, without any fracture or dislocation whatever; and it is certain, that most of the cases mentioned by authors as dislocations of the lumbar and dorsal vertebræ, have only been concussions of the spinal marrow, or fractures of such bones.

The cervical vertebræ, however, not having such extensive articular surfaces, and having more motion, are occasionally luxated. The dislocation of the head from the first vertebra, and of the first vertebra from the second, particularly the last accident, is the most common; but luxations of the cervical vertebræ lower down, though very rare, are possible. (*Boyer.*)

DISLOCATION OF THE HEAD FROM THE FIRST VERTEBRA, OR ATLAS.

The os occipitis, and first cervical vertebra are so firmly connected by ligaments, that there is no instance of their being luxated from an external cause, and, were the accident to happen, it would immediately prove fatal by the unavoidable compression and injury of the spinal marrow.

An anchylosis, however, has been observed between the occiput and the atlas, attended with a change in their relative position and a lessening of the foramen magnum. A preparation of this kind is preserved in the Museum of Natural History at Paris. Levéillé conceives, that it must be this specimen, of which mention is made in the writings of Duverney and Bertin, and that the case originated from some chronic disease. (*Nouvelle Doctrine Chirurgicale, Tom. 2, p. 60.*)

DISLOCATIONS OF THE FIRST CERVICAL VERTEBRA FROM THE SECOND.

Every surgeon is aware, that the rotatory motion of the head is chiefly performed by the first vertebra moving on the second. When this motion is forced beyond its proper limits, the ligaments which tie the processus dentatus to the edges of the foramen magnum are torn, and, supposing the head to be forced from the left to the right, the left side of the body of the vertebra is carried before its corresponding articulating surface, while the right side falls behind its corresponding surface. Sometimes the processus dentatus, whose ligaments are ruptured, quits the foramen formed for it by the transverse ligament and the anterior arch of the first vertebra, and presses on the spinal marrow. In other instances, the processus dentatus does not leave its

natural situation; but the diameter of the vertebral canal is always diminished at this place, and the spinal marrow consequently compressed, and otherwise injured. Patients can hardly be expected to survive mischief of this kind in so high a situation; indeed, they are frequently killed almost instantaneously.

According to surgical writers, the causes, which may produce this formidable accident, are various: a fall on the head from a high place; the fall of a heavy body against the back of the neck; a violent blow; a forcible twist of the neck; tumbling; standing upon the head; the rash custom of lifting up children by the head, &c. M. Louis found, that the first vertebra was dislocated from the second in the malefactors hanged at Lyons, at which place, the executioner used to give a sudden twist to the body, at the moment of its suspension.

Many dislocations of the cervical vertebræ do not prove fatal; but these occur at the third, fourth, fifth, or sixth of these bones, and only one articular process is luxated. In these instances, the vertebral canal is not so much lessened as to compress the spinal marrow, and occasion death.

If the luxation produce no symptom, which indicates a compression of the spinal marrow, it is prudent to abstain from all attempts to reduce it. When the symptoms are urgent and alarming, and some attempt to relieve the patient is the only chance he has of living, we are to begin by inclining the head to the side towards which it is directed, in order to disengage the articulating process of the upper vertebra: this part of the operation is extremely dangerous, as it may instantly produce death by increasing the pressure on the spinal marrow. When the process is disengaged, the head and neck are brought to their right direction, by making them perform a rotatory motion the contrary of that, which has taken place in the luxation. A relapse is to be prevented by keeping the head and neck perfectly motionless. (*Boyer.*)

There can be no doubt of the rationality of attempting an immediate reduction of the process dentatus, if signs of life should exist. This process is thrown back, so as to compress or injure the spinal marrow, while the atlas and the head itself are thrown forward. The recollection of these circumstances will enable a surgeon to do what is proper, better than any detailed directions.

A mother brought her child to Desault, with its neck bent, and its chin turned towards the right shoulder. The acci-

dent had been a consequence of the head having been fixed on the ground, while the feet were up in the air. A surgeon happened to be with Desault at the time, and they agreed to make an attempt to reduce the luxation, and to apprise the mother, that though the child might be cured, there was a possibility of its perishing under their hands. Being permitted to do what they judged proper, they fixed the shoulders, and the head was gently raised, and gradually turned into its natural position. The mother was rewarded for her courageous resignation; the child could now move freely; the pain ceased, and a considerable swelling in the situation of the luxation alone remained, and it was dispersed by the application of emollient poultices. (*Leveillé, Nouvelle Doctrine Chirurgicale, Tom. 2, p. 62.*)

Another alleged instance of the reduction of such a dislocation is also recorded by Dr. Settin in *Schnucker's Vermischte Chirurgische Schriften*. However, both in this case, and that related by Desault in his lectures, much doubt may be entertained, whether the accident were really such as it was supposed to be.

DISLOCATIONS OF THE CLAVICLE.

These are much less common, than fractures, which are said to occur six times more frequently.

The clavicle may be luxated at its sternal extremity, forwards, backwards, and upwards, but never downwards, on account of the situation of the cartilage of the first rib. The luxation forward is the most frequent, and almost the only one ever met with. It may arise from the other end of the clavicle being forced very much backward. Dislocations backwards and upwards are very unusual. To cause the first sort of accident, the shoulder must have been violently driven forwards, and at the same time depressed with great force. The dislocation backward, is more rare, than the one upward.

If the dislocation be forwards, a hard circumscribed tumour is felt, or even seen, on the front and upper part of the sternum. When the shoulder is carried forward and outward, this tumour disappears, and, previously, there is a vacancy where the head of the clavicle ought to be.

When the luxation is upwards, the distance between the sternal ends of the clavicles is diminished.

When the dislocation is backwards, there is a depression where the end of

the clavicle ought to be, and the head of the bone forms a projection at the front and lower part of the neck, which, as J. L. Petit remarks, may compress the trachea, œsophagus, jugular vein, carotid artery, and nerves. The head is inclined towards the side, on which the accident itself is situated.

In reducing these dislocations of the sternal end of the clavicle, we are to make a lever of the arm, by means of which the shoulder is brought outwards; and when thus brought outwards, it is to be pushed forwards, if the dislocation is in that direction; backwards, if the dislocation be behind; and upwards, if the dislocation be above.

It is as difficult to keep the bone reduced, as it is easy to reduce it, so smooth and oblique are the articular surfaces.

The same position of the arm, and the same apparatus, as in fractures of the clavicle, are to be employed. The end of the clavicle, however, can never be kept from rising a little, and this would be the case even were the tourniquet used, which was proposed by Brasdor, for making pressure on the end of the bone.

The dislocation of the scapular end of the clavicle from the acromion is much less common. The luxation upwards is almost the only one that ever occurs. It is possible, however, for the accident to take place downwards, and for the end of the clavicle to glide under the acromion. The rarity of dislocations of the scapular end of the clavicle, is owing to the strength of the ligaments tying the clavicle and acromion together.

A fall on the top of the shoulder may cause the dislocation upwards. The scapular end of the clavicle then slides upwards on the acromion, and the shoulder is drawn inwards by the muscles which approximate the arm to the body.

The violent action of the trapezius muscle, in pulling upward the clavicle, may tend to produce the accident.

Pain at the top of the shoulder, and a projection of the end of the clavicle, under the skin covering the acromion, are symptoms indicating what has happened. The patient also inclines his head to the affected side, and avoids moving his arm or shoulder.

This dislocation is reduced by carrying the arm outwards, putting a cushion in the axilla, and applying Desault's bandage for fractures of the clavicle, making such turns as ascend from the elbow to the shoulder, and press the luxated end of the bone downward, so as to keep it in its due situation. (See *Boyer's Leçons sur les Maladies Des Os.*)

Most surgeons, in this country, would be content with applying a compress, the figure of 8 bandage, and supporting the arm in a sling.

DISLOCATIONS OF THE OS BRACHII.

Nature, which varies according to the necessities of different animals, the number of their joints, has also been provident enough to vary the structure of these parts, according to the use of the different portions of their economy. To great moveableness some unite considerable solidity; for instance, the vertebral column. Others are very strong, but only admit of a slight yielding motion, as we observe in the carpus, tarsus, &c. Lastly, other joints admit of a great latitude of motion; but their strength is easily overpowered by the action of external bodies. Such are, in man, the shoulder-joint, and that between the sternum and clavicle.

The last kinds of articulation are particularly subject to dislocations, and, of all, not one is so often luxated as the shoulder-joint. Bichat mentions, that it appears, from a comparative table, that, in some years, this accident, at the Hotel-Dieu, has been as frequent, and even more so, than dislocations of all the other bones taken collectively.

Here every thing seems to facilitate the escape of the bone from its natural cavity. An oval shallow cavity, surrounded by a margin of little thickness, receives a half-spherical head, which is twice as broad as the cavity in the perpendicular direction, and three times as extensive from before backward. With respect to the ligaments, the joint is only strengthened by a mere capsule, which is thin below, where nothing opposes a dislocation; but thicker above, where the acromion, coracoid process, and triangular ligament, form an almost insurmountable obstacle to such an accident. With regard to the muscles, and motions of this joint, strong and numerous fasciculi surround the articular surfaces, make them easily move in all directions, and pushing the head of the os brachii against the different points of the capsule, distend this ligamentous bag, and, when their power exceeds the resistance, actually lacerate it. As for external bodies, what bone is more exposed than the os brachii, to the effect of their force?

Thus subjected to the influence of these predisposing causes, the os brachii would be in continual danger of being dislocated, if the scapula, which is as moveable as itself, did not furnish a point of support for it, by accompanying its mo-

tions. This point of support accommodates itself to the variations in the position of the head of the os brachii, so that to the moveableness of the articular surfaces, their strength is, in a great measure owing.

DIFFERENT KINDS OF DISLOCATION.

The shoulder-joint, very liable to luxations in a general sense, is not equally so at all points. There are some, where a dislocation cannot occur; there are others, where, though possible, such an accident has never been observed. Hence, before examining the mechanism of dislocations of this joint, it is essential to determine with precision the directions in which they may take place. Here, indeed, authors differ in a very singular manner. Sometimes, they have employed different terms to express the same thing; and, sometimes, they have employed the same words to signify different things. Invariably agreed about certain kinds of dislocations, they entertain opposite sentiments concerning others; and, in the midst of these differences, the perplexed surgeon often cannot decide on what basis to found his practice.

DIVISION ADOPTED BY AUTHORS.

The ancients, who knew very little of the natural relation of the parts surrounding the joint, were totally ignorant of the accidental relations, which such parts present in the case under consideration. Hence, no doubt, arose the confusion in their doctrines.

Many admitted four kinds of dislocations; many only three; some acknowledged only two; while others only allowed the possibility of one kind.

The first distinguished the different directions, in which the bone can be luxated. The dislocations were termed *upward*, *downward*, *forward*, and *backward*. Such was the opinion of the predecessors of Hippocrates, who, in informing us of it, demonstrates its inaccuracy. Others divided the dislocations of the shoulder into such as take place *downward*, *upward*, *outward*, and *forward*. This division is adopted by Galen, who, however, only cites an example of the luxation forward, and does not illustrate what he means by dislocations upward, and inward.

The second class of writers distinguished the species of dislocation, sometimes into those which occur *downward*, *forward*, and *backward*. Oribasius was one of these. Sometimes, they named the luxations *downward*, *outward*, and in-

ward. Paul of Ægina followed this plan, and, no doubt, his meaning is the same as that of Oribasius, only expressed in different terms. Sometimes, they called the dislocations *downward*, *forward*, and *upward*. Albucasis did so, and thought the latter case exceedingly uncommon.

The third set believed, that when the head of the os brachii was displaced, it could only be carried *downward into the armpit*, a very common case; and *forward*, which is less frequently seen. Celsus is almost the only one, who has established this difference: he remarks, *Humerus modò in aliam excidit, modò in partem priorem*.

Lastly, the fourth body of men only believed in the dislocation downward; which was the sentiment of Hippocrates, who had only seen this one sort of case in his practice. *At verò humerus inferiorem in partem excidit; aliam in partem excidere non auidit*.

The moderns borrowed from the ancients their divisions of dislocations of the shoulder-joint, and, at first, like their predecessors, they only determined in a vague manner the precise situation of these accidents. However, they afterwards fixed it with more determination; in proportion as they became enlightened by anatomy, and, in particular, took notice of the essential difference between primitive and consecutive luxations.

Petit admits four kinds of dislocations. 1. Downward on the inferior costa of the scapula, very rarely met with. 2. Outward, under the spine of this bone; a case, which as a primitive one, can only occur with difficulty. 3. Inward, into the armpit. 4. Forward, between the coracoid process and the clavicle. Heister, like this eminent practitioner, acknowledged four dislocations; but with a difference both of expression and meaning. One is downward, in the axilla; one forward, under the great pectoral muscle; another backward, under the scapula; and a fourth outward, under the spine of this bone. According to Duverney, primitive luxations never occur in any other direction than downward; the others being all the constant effect of muscular action.

DIVISION ADOPTED BY DESAULT.

In the midst of these very confused ways of viewing a very simple subject, it is, in the first place, necessary, in order to have determinate ideas, to divide dislocations of the humerus into *primitive* ones, which are the sudden effect of external violence, and into *consecutive* ones,

which follow the first, by the influence of causes, which will be investigated.

Let the oval surface of the glenoid cavity be included within four lines; one representing its upper edge; another its lower; a third its inner edge; and a fourth its external one.

It is manifest, that the head of the humerus cannot be displaced towards the upper edge. There are situated the acromion and coracoid process, the triangular ligament stretched between them, the tendons of the triceps, supra-spinatus, and the fleshy portion of the deltoid, insurmountable obstacles to the luxation of the head of the bone, propelled by any force upward. Besides, what power could this be? Supposing there were such a force, the head of the bone must necessarily be driven outward as well as upward, ere its head would be displaced. This is impossible, because the trunk prevents the lower part of the arm from being directed sufficiently inward to produce this effect.

On the contrary, at the other margins, there is little resistance. At the inferior one, the long portion of the triceps; at the internal one, the tendon of the subscapularis; and at the external edge, those of the infra-spinatus, and teres minor; are capable of easily yielding to any power directed against them, and of allowing primitive luxations to take place, downward, inward, or outward. Downward, between the tendon of the long portion of the triceps, and the tendon of the subscapularis; inward, between the fossa subscapularis, and muscle of this name; outward, between the fossa infraspinata, and infraspinatus muscle.

After being pushed out of its cavity, and first placed in one of these three directions, the head of the humerus often changes its position; and then, to primitive luxations, downward, or inward, a consecutive one succeeds. But, the latter could never follow the primitive dislocation outward, were this to exist; as the spine of the scapula would form an obstacle.

A consecutive luxation inward may succeed a primitive one downward: indeed, nothing resists the head of the humerus, in the course which it then follows to get between the fossa subscapularis and the muscle similarly named. On the contrary, should it tend outward, it is opposed by the tendon of the triceps, and notwithstanding what Petit has written, there is never a consecutive dislocation in this direction.

It sometimes happens, that, after the head of the bone has escaped from the internal or inferior part of the capsule, it

is carried behind the clavicle, and then forms a consecutive dislocation upward; an event already noticed by Ambroise Paré, perhaps by Galen, and a specimen of which was preserved in Desault's cabinet. But, here, the secondary derangement only takes place slowly, and, when it occurs, it is almost always out of the power of art to rectify it, on account of the strong adhesions, contracted by the surfaces of the bone. Thus, in the instance to which allusion has been made, a new cavity was seen formed behind the clavicle, and the humerus adhered by new kinds of ligaments to the surrounding parts.

It follows, from what we have just been saying, that the humerus is subject to four kinds of dislocation. 1. Downward. 2. Outward. In these two directions the accident is always primitive. 3. Inward, which is sometimes primitive, sometimes consecutive. 4. Upward; a case which can never occur, except as a consecutive one.

The second and fourth cases are so very rare in comparison with the others, that these alone claim the practitioner's attention.

CAUSES, &c.

These vary according as the dislocation is primitive, or consecutive.

PRIMITIVE DISLOCATION.

The action of external bodies, directed against the arm; but, particularly, falls, in which this part is forced against a resisting body, gives rise to primitive dislocations, and then the different species of the accident are determined, by the particular position of the humerus at the instant, when the injury takes place.

Should this bone be raised from the side, without being carried either forward, or backward; should the elbow be elevated, and the fall take place on the side; then the weight of the trunk, almost entirely supported by this bone, forces downward its upper part, and this stretches and lacerates the lower part of the capsular ligament. Thus a luxation downward is produced, and its occurrence may also be facilitated by the combined action of the latissimus dorsi, pectoralis major, and teres major, muscles, as Fabre has judiciously remarked. Then, indeed, involuntarily contracted to support the trunk, these muscles act with the power of a kind of lever; in which operation the resistance is the head of the bone, which they draw downward, while the

fixed point is the lower end of the bone, resting against the ground. Some authors also consider, as the immediate cause of a dislocation downward, the strong action of the deltoid, which then depresses the head of the bone, and pushes it downward out of the capsula. Certain observations seem incontestably to establish this mode of dislocation. Bichat mentions the well-known cause of a notary, who luxated his arm downward, in lifting up a register.

The rationale of the primitive luxation inward differs very little from that of the preceding case. The elbow is both separated from the side, and carried backward: in falling, the weight of the body acts on the humerus, the front part of the capsule is lacerated, and a luxation takes place in this direction.

The dislocation outward is produced in the same sort of way. The elbow is carried forward, towards the opposite shoulder; the capsule is stretched outward, and if a sufficient force should act on the limb, is lacerated. But, how could such a force arise? In a fall, the arm pushed against the trunk, and kept there, could not move extensively enough to cause such a laceration. Hence, the luxation outward must necessarily be exceedingly rare. Indeed, there is no instance recorded of it in surgical books, and Desault in particular, never had occasion to observe such an accident. Besides, when, in a fall, the arm, raised from the side, is inclined forward or backward, the weight of the body only operates upon it obliquely, and the limb is very little exposed to the action of the latissimus dorsi, pectoralis major, and teres major muscles. No dislocation must occur more frequently, than that downward, in which the influence of both these causes is direct. The luxation inward, however, is very common, and a multitude of cases, which occurred to Desault confirm this kind of primitive dislocation, doubted by several modern authors, who are of opinion, with Hippocrates, that all dislocations at first take place downward.

The capsule may only be stretched in a primitive luxation, and then the articular surfaces only lose their relations imperfectly: but, most frequently, it is lacerated, and the head of the bone passes through the rupture. Authors have, in general, paid too little attention to this circumstance, which dissections have repeatedly demonstrated to practitioners, and to Desault in particular. This eminent surgeon had two specimens made of wax; one, of a dislocation inward; the

other of one downward; both of which were met with in subjects, who died at the Hôtel Dieu. Bell also makes mention of similar facts, and another English surgeon, says Bichat, has observed the same occurrence. I suppose Bichat here alludes to Mr. Thompson, who long ago noticed the laceration of the capsule, and particularly called the attention of surgeons to the subject, in the Medical Observations and Inquiries.

Here the same thing often happens, which is seen to occur in compound fractures, in which the ends of the broken part protrude through the skin. The capsule is sufficiently torn to let the head of the bone escape; but, the opening, afterwards being too narrow, forms a kind of constriction round the neck of the humerus, so as to prevent the return of the head of the bone into the place, which it originally occupied. Thus, in the fractures, of which we have just been speaking, the opening of the skin will not allow the end of the fracture to be reduced, without a previous dilatation of the wound.

In this state, should we endeavour to reduce the dislocation, the capsule being pushed against the glenoid cavity, becomes compressed between it and the head of the bone, which the surgeon now in vain attempts to reduce. Desault, was the first who noticed this practical fact, two examples of which are recorded in his journal, and cases of which have since very often presented themselves at the Hôtel Dieu. In these cases, the head is commonly very moveable, because, being entirely on the outside of the capsule, nothing restrains its motions.

CONSECUTIVE DISLOCATION.

When a consecutive luxation follows a primitive one, several causes may concur in producing it. If a fresh fall should happen, while the arm is separated from the trunk, the head of the humerus, which nothing confines, obeys, with the utmost facility, the power displacing it in this manner, and is again pushed out of the situation, which it accidentally occupies.

A man, in going down stairs, meets with a fall, and dislocates the humerus downward; he immediately sends for Desault, who defers the reduction till the evening. In the mean time, the patient in getting upon a chair, slips and falls again. The pain was more acute, than when the first accident occurred, and Desault, on his return, instead of finding the head of the humerus

as it was in the morning, in the hollow of the axilla, finds it behind the pectoralis major muscle.

The action of muscles is a permanent cause of a new dislocation. When the humerus, indeed, is luxated downward, the pectoralis major, and the deltoid draw upward, and inward, the upper part of this bone, which, only making a weak resistance to their action, changes its position, and takes one in the above double direction.

The various motions imparted to the arm, may also produce the same effect, according to their direction. Thus a luxation inward has often been observed to follow one downward, in consequence of unskilful efforts to reduce the latter.

SYMPTOMS.

The diagnosis of dislocations of the humerus is, in general, attended with no difficulties.

Whatever may be the mode and situation of the dislocation, there always exists, as Hippocrates has remarked, a manifest depression under the acromion, which forms a more evident projection, than in the natural state. Almost all the motions of the arm are painful; some cannot be performed at all; and they are all very limited. The arm cannot move without the shoulder moving also, because the articulation being no longer able to execute its functions, both it and the shoulder form, as it were, one body.

To these symptoms, generally characteristic of every sort of dislocation of the humerus, are to be added such as are peculiar to each particular case. When the luxation is downward, the arm is a little longer, than in the natural state; it is capable of being moved a little outward; but, an acute pain is the inevitable consequence of moving it either forward, or backward. The elbow is more or less removed from the axis of the body, by the action of the deltoid, the long head of the biceps, and supraspinatus muscles, which, being stretched, contract and tend to draw the bone outward. The pains, which result from this position, compel the patient, in order to avoid them, to lean towards the side, on which the dislocation is, to keep the forearm half bent, and the elbow supported on his hip, in such a way, that the arm, having a resting place, may be sheltered from all painful motion, and stretching of the muscles. By this posture alone, Desault was in the habit of detecting a luxation downward, and his diagnosis was seldom found to be erroneous. Thus, in a fracture of the clavicle, the leaning posture of the patient is of-

ten, at the first glimpse, characteristic of the accident. In the axilla, there is constantly a more or less evident prominence, formed by the head of the humerus.

With the general symptoms of dislocations of the humerus, that inward has the following: the elbow, separated from the axis of the body, is inclined a little backward; the humerus seems to be directed towards the middle of the clavicle; motion backward is not very painful, but that forward is infinitely so; there is a manifest prominence under the great pectoral muscle; the arm is very little longer than in the natural state; and the posture is the same, as in the foregoing case.

If there should be a dislocation outward, it would be particularly characterized by a hard tumour under the spine of the scapula; by the direction of the elbow forward; by its separation from the trunk; and by the somewhat increased length of the arm.

A projection behind the clavicle; a manifest shortening of the arm; and its direction; would clearly denote a dislocation upward.

The symptoms, distinguishing the nature of dislocations of the humerus, do not always present the same degree of certainty, as those announcing the existence of such an accident. Often nothing is more difficult, than to determine, whether the case is a primitive dislocation inward, or a consecutive one; the same phenomena being observable in both cases. An accurate history of the case, by representing the order in which such phenomena occurred, can alone throw light on this point, which is the more interesting, as in the two cases, the means of reduction should vary. In the first, the head of the bone returns, through a short track, into its natural cavity; in the second, it has to traverse a much greater distance to arrive there.

If, as Petit has pretended, there are dislocations backward, sometimes primitive, sometimes consecutive, this remark would be equally applicable to them.

Some analogous symptoms, between dislocations of the humerus, the fracture of its neck, and luxations of the scapular end of the clavicle, might here create some uncertainty, if, in the latter case, the absence of a tumour in the arm-pit, and of a depression under the acromion, did not prevent an error, which, Hippocrates says, may be easily made; into which, Galen states, the masters of the art fell; and which Paré cautions us to avoid. Uncertainty might arise, if in the fracture of the neck of the humerus, the proper symp-

toms of a fracture did not prevent a most detrimental mistake, which the occasional direction of the humerus, and a kind of prominence, formed by the lower end of the fracture in the axilla, might cause. (See *Fracture of the Neck of the Humerus*.)

Inflammatory symptoms seldom follow dislocations of the humerus. Many authors, particularly B. Bell, speak of an œdematous swelling of the whole upper extremity, as a very common consequence of a dislocation inward, and it is referred to the compression of the axillary glands. Experience has not often demonstrated this occurrence at the Hôtel Dieu, except in very old luxations; and when the thing has occurred, very beneficial effects have been obtained, in certain instances, by applying, for a few days, a moderately tight bandage from the fingers up to the axilla, after the reduction has been accomplished. Bichat relates a case, in which the œdema did not disappear with the cause, but even rather increased; but the day after a bandage had been applied, the swelling was found diminished by one half.

There is another consequence, to which authors have paid but little attention; but, it was known to Avicenna, and was several times observed by Desault. This is a palsy of the upper extremity, arising from the pressure, made by the head of the bone, dislocated inward, upon the axillary plexus of nerves. This consequence sometimes resists all the means of art, as Bichat proves by a case, which he relates.

The affection is very difficult of cure, when the nerves have been a long time compressed. Desault several times applied the moxa above the clavicle. The success, which he first experienced on some patients, did not follow invariably in others.

But, when the head of the humerus has only made, as it were, a momentary pressure on the nerves, and the reduction has been effected, soon after the appearance of the symptoms, the paralytic affection often goes off of itself, and its dispersion may always be powerfully promoted by the use of volatile liniments.

OF THE REDUCTION.

We may refer to two general classes, the infinitely various number of means, proposed for the reduction of the dislocated humerus. The first are designed to push back, by some kind of mechanical force, the head of the bone, into the cavity from which it is displaced, either with, or without making previous extension. The others are merely intended to disen-

gage the head of the bone from the place which it accidentally occupies, leaving it to be put in its natural situation by the action of the muscles.

By the first means, art effects every thing; by the second, it limits its interference to the suitable direction of the powers of nature. In the first method, the force externally applied always operates on the bone in the diagonal of two powers, which resist each other at a more or less acute angle; in the last, the power is only in one direction.

Here it is only necessary to state, that all the means, intended to operate in the first way, act nearly in the following manner. Something, placed under the axilla, serves as a fulcrum, on which the arm is moved as a lever, the resistance being produced by the dislocated head of the humerus, while the power is applied either to the lower part of this bone, or the wrist. The condyles of the humerus being pushed downward and inward, the head of the bone is necessarily moved in the opposite direction, towards the glenoid cavity, into which it slips with more or less facility.

Thus operated the machine, so celebrated among the ancients and moderns, under the name of the *ambi* of Hippocrates; whether used in the form described by this father of medicine, or with the numerous corrections devised by Paul of Ægina, Ambroise Paré, Duverney, Freke, &c. By this machine, a double motion is communicated to the head of the humerus, as above explained.

The extension usually moves the bone from its unnatural situation, and is executed in different ways. Sometimes, the weight of the body on one side, and the dragging of the end of the dislocated bone on the other, tend to produce this effect. Such was the action of the ladder, door, &c. described in Hippocrates's *Treatise on Fractures*, and repeated in modern works. Sometimes, the trunk is fixed in an unchangeable manner, while the arm is powerfully extended, as is practised in employing the machine of Oribasius, and was one of the methods formerly adopted in the public places, where the wrestlers combated.

Sometimes, no extension is sensibly executed and while the end of the humerus is pushed outward by a body placed under the axilla, the surgeon pushes it upward into the glenoid cavity.

We shall not here inquire into the inconveniences peculiar to each of these methods. Petit and B. Bell have already done so. We shall only point out the objections, common to all of them.

The exit of the head of the bone,

through the lacerated capsule is not necessarily attendant on the dislocation. Nor is it even possible to know with precision the situation of this opening. Why then should we make use of an artificial force to direct the head of the bone towards this opening?

However covered the body, placed under the axilla, may be, to serve as a fulcrum, there is always a more or less inconvenient chafing, frequently dreadful stretching and laceration of parts, in consequence of its application, when the trunk is suspended upon it, as in the instance of the door, &c. In this way, Petit has seen a fracture of the neck of the humerus produced, and even a laceration and aneurism of the axillary artery.

Few surgeons have ready at hand the different kinds of apparatus. Hence, trouble and loss of time in getting them; time, which is of so much moment in the reduction; this being always the more easy, the sooner it is accomplished.

When the luxation is consecutive, how can mechanical means bring back the head of the bone, through the track it has taken? For instance, if to a dislocation downward one inward has succeeded, the head of the bone must necessarily be brought down, before it can be replaced in its cavity. The above artificial means often act repugnantly to the action of the muscles, which is a chief and essential agent in the reduction.

If the dislocation should be upward, they would obviously be ineffectual.

Perhaps, however, they might be advantageously employed, when a primitive luxation downward is quite recent, and when the head of the bone is very near its cavity. Then the inferior costa of the scapula presents an inclined plane, along which the end of the bone can easily glide, when propelled by any kind of external force. No doubt, it is to this tendency of the head of the bone to be replaced, that we must attribute the success, certainly exaggerated, but in part real, on which the inventor of such machines endeavours to establish the superiority of his plan.

But, in this case, it is useless to multiply artificial powers, when natural means suffice, and when we can accomplish the reduction with the hands more effectually, because we can vary the motions with more precision.

Thus Desault very often employed the following method with great success. The patient being seated upon a chair of moderate height, he took hold of the hand on the affected side, placed it between his knees, which he moved downward and backward, in order to make the extension, and disengage the head of the bone, while

an assistant held back the trunk to effect the counter-extension. This was sometimes executed by the weight of the body, and effort of the patient. At the same time, the surgeon's hands applied to the arm, in such a way, that the four fingers of each were put on the hollow of the axilla, and the thumbs on the outer part of the arm, pushed upward, and a little outward, the head of the humerus, which usually returned with ease into its natural cavity.

Petit explains this plan, though not as here described, but complicated with the use of a napkin, passed under the patient's axilla, and over the surgeon's neck, who contributes to raise the dislocated end of the bone, by lifting up his head. This accessory method is always useless, and little methodical, preventing, also, such variation of the motions, as one may wish. The hands alone are always sufficient, and a multitude of instances attest the efficacy of this method, employed in Desault's way.

When the luxation downward has been very recent, Desault has, two or three times, succeeded in reducing it, by a still more simple process. Maria-Louise Favert fell in going down stairs, dislocated her arm downward, and was conveyed, immediately after the accident, to the Hôtel-Dieu. Desault having recognized the disorder, placed his left hand under the axilla, to serve as a fulcrum, while with the right, applied to the lower and outer part of the arm, he depressed the humerus towards the trunk, and at the same time raised the upper part of the bone. The head of the humerus directed upward and outward by this double motion, returned into the glenoid cavity, without the least resistance. The arm was placed in a sling for two days, and, on the fourth, the patient resumed her wonted labour.

Dislocation downward are not the only ones, to which the first of the above simple plans is applicable. Primitive luxations inward sometimes yield to its adoption. Two examples of such success are to be found in the *Journal de Chirurgie*.

REDUCTION BY EXTENSION ALONE.

For the most part, however, such means are inadequate, and extension must be made. This employed alone, forms a second sort of means for reducing dislocations of the shoulder, and a few practitioners have deviated from the beaten path, and tried this latter plan. Celsus had recourse to nothing but extension in the ordinary cases of dislocation downward and forward. Albucasis was ac-

quainted with no other mode. Douey, Douglas, and Heister, among the moderns, have absolutely rejected the use of machines, as always useless, and frequently dangerous. Lastly, Dapoui and Fabre examined with more exactness the process of extension, pointed out the manner of rendering it most advantageous in all cases, by the proper application of the extending force; and, in the dislocation of the humerus in particular, they obviated the inconvenience of pulleys, placed under the arm-pit on the affected side, shewing that the motion, vulgarly termed, coaptation, was of no utility. In these respects, the art is indebted to them for real improvement, and their doctrine, now universally diffused, was principally put into practice by Desault, who made it the base of his method of reducing all fractures, and dislocations in general.

To reduce a dislocation of the humerus, it is necessary to have a sufficient number of assistants, in order to increase the power according to the resistance which is to be overcome. But, two are usually sufficient for making the extension: in doing which, one should employ a linen pad, of sufficient thickness to project above the level of the pectoralis major, and latissimus dorsi. There must also be two bandages; one made of linen, several times doubled, four inches wide, and eight or nine feet long; the other being a towel, folded in the same way, and which is often unnecessary.

The patient is to sit on a chair of moderate height, or else he may lie down upon a table, which is firmly fixed, and covered with a mattress.

Desault, for a long while, used to put the patient in the first of these positions, which, though generally employed in practice, is not the best. In it the arm may be advantageously drawn in a transverse direction; but if, as is often the case, there be occasion to make extension upward or downward, the assistant is then obliged to rise up, and depress himself, has not sufficient power, finds himself obstructed, and cannot vary, at the pleasure of the surgeon, the direction in which the arm is to be extended. This position is also much more fatiguing to the patient, than one in which the trunk is equally supported upon a horizontal plane.—Hence, Desault, in the latter years of his practice, abandoned the first position, and invariably adopted the last.

The patient being put in the proper position, the linen compress is to be put under the axilla, on the side affected, and upon this compress the middle of the first extending bandage is to be put, while its two heads ascending obliquely before and

behind the chest, meet each other at the top of the sound shoulder, and are held there by an assistant, so as to fix the trunk, and make the counter-extension. The action of this bandage does not affect the margin of the pectoralis major and latissimus dorsi, in consequence of the pad projecting higher than them. If this were not attended to, these muscles being drawn upward, would pull in this direction the humerus, to which they are attached, and would thus destroy the effect of the extension, which is to be made in the following manner:—

Two assistants take hold of the forearm above the wrist, or else the towel, doubled several times, is to be applied to this part. The two ends are to be twisted together, and held by one or two assistants, who are to begin pulling in the same direction in which the humerus is thrown. After this first proceeding, which is designed to disengage the head of the bone from its accidental situation, another motion is to be employed, which differs according to the kind of luxation. If this should be downward, the arm is to be gradually brought near the trunk, at the same time that it is gently pushed upward. Thus, the head of the bone being separated from the trunk, and brought near the glenoid cavity, it usually glides into this situation with very little resistance.

When the luxation is inward, after the extension has been made in the direction of the humerus, the end of this bone should be inclined upward and forward, in order that its head may be guided backward; *vice versâ*, when the luxation is outward.

When the head of the bone has been disengaged by the first extension, the motion imparted to it by the rest of the extension, should in general be exactly contrary to the course which the head of the bone has taken, after quitting the glenoid cavity. When there is difficulty experienced in replacing the head of the bone, we should, after making the extension, move the bone about in various manners, according to the different direction of the dislocation, and the principle just noticed. This plan often accomplishes what extension alone cannot; and the head of the bone, brought by such movements towards its cavity, returns into it, while they are being executed.

When the dislocation is a consecutive one, it is the first extension, made in the direction of the displaced bone, which brings back its head to where it was primitively lodged, in order to act upon the bone afterwards, just as if the luxation were one of the primitive sort. Often it is only at the moment of the reduction,

that it is possible to distinguish, whether a luxation is of one or the other kind. Indeed, as the reduction mostly takes place of itself, when the extension is properly made, if the head be situated consecutively inward, it is seen to descend along the internal part of the scapula, then to proceed to the lower part, and, lastly, to ascend towards the opening of the capsule, into which opening it returns.

When the extension is properly made, the reduction is almost spontaneously effected. Indeed, whatever may be the kind of primitive dislocation, it is clear, that the muscles on one side of the articulation must be put upon the stretch, while those on the other must be relaxed. Hence, a change must necessarily follow both in their directions and contractions, and also in the direction of these contractions. From this change the muscles, when they act, instead of drawing back the head of the bone towards the ruptured capsule, pull it in another direction, and thus produce a consecutive dislocation.

But, if by rectifying things, the extension should chance to restore to the muscles their former direction, then obeying their natural irritability, increased by the stretching of the extending power, they will bring back the head of the bone to the opening in the capsule, and oblige it to enter with much more certainty, than the efforts of the surgeon could do, who is always ignorant of the precise situation of this opening. On the contrary, if the extension, in consequence of not having been properly made, should not have restored to the muscles their natural direction, then the head of the bone will be drawn to some other point of the capsule, away from that which has been lacerated: and hence arise the very frequent difficulties attendant on the reduction of dislocated shoulders.

It follows from what has been said:—
1. That all the art of treating dislocations, consists in giving a proper direction to the extending force. 2. That in general the coaptation is useless. 3. That reducing a dislocation does not consist in putting back the head of the bone into its cavity; but, in putting the muscles in a proper state for accomplishing this reduction, and that here, as every where else, art is only the handmaid of nature.

There are cases, however, in which the action of the muscles, being perverted by the oldness of the dislocation, and by the adhesions contracted with the surrounding parts, it becomes necessary to employ such means, as will serve to force, as it were, the head of the bone into its cavity, whither the muscles cannot bring it.

With reasoning is combined experi-

ence, which is always the most effectual proof of this doctrine, both respecting reductions of the dislocated humerus, and of such accidents in general. Desault only employed extension, variously diversified, till he had put the muscles in a state, favourable for accomplishing reduction. The most prompt success constantly crowned this part of his practice, and, doubtless, much of this success must be imputed to his wisely refusing to interfere in too great a degree.

When the reduction has been accomplished, if the arm should be very moveable, and seem to have a tendency to be dislocated again, it must be fixed, for a few days, in such a way as will prevent all motion.

A sling, well applied, suffices for this purpose; and, indeed, the arm should always be kept quietly supported in one, after a dislocation. The French apply the bandage, which Desault has recommended for the fractured clavicle.

OF SOME CIRCUMSTANCES, RENDERING THE REDUCTION MORE DIFFICULT.

1. *Narrowness of the opening of the Capsule.*

The opening of the capsule, being too narrow to allow the head of the bone to return into the glenoid cavity, is one of the chief impediments to reduction. The obvious indication is to enlarge such an opening, by lacerating its edges. This is fulfilled by moving the bone about freely, in every direction, particularly in that in which the dislocation has taken place. Now, by pushing the head of the bone against the capsule already torn, the latter becomes lacerated still more, in consequence of being pressed between two hard bodies. The reduction, which is frequently impracticable before this proceeding, often spontaneously follows, immediately after it has been adopted. In the *Journal de Chirurgie* are two cases, by Anthaume, and Faucheron, establishing this doctrine.

Mr. White, of Manchester, believed, that the reduction was sometimes prevented by the head of the bone not being able to get through the laceration in the capsule again. He succeeded in reducing some such cases in the following manner: having screwed an iron ring into a beam at the top of the patient's room, he fixed one end of the pulleys to it, and fastened the other to the dislocated arm by ligatures about the wrist, placing the arm in an erect position. In this way, he drew up the patient, till his whole body was suspended; but, that too much force might not be sustained by the wrist, Mr.

White at the same time directed two other persons to support the arm above the elbow. He now used to try with his hands to conduct the arm into its place, if the reduction had not already happened, as was sometimes the case. Occasionally, a snap would be heard, as soon as the patient was drawn up; but, the reduction could not be completed, till he was let down again, and a trial made with the heel in the arm-pit. When no iron ring was at hand to suspend the patient from, Mr. White used to have the patient raised from the ground by three or four men, who stood upon a table. (*Cases in Surgery, by Charles White, F. R. S. p. 95.*)

2. *Oldness of the Dislocation.*

This is a second impediment to reduction, still more difficult to surmount than the foregoing one. The head of the bone, which has lodged a long while in its accidental situation, contracts adhesions to it. The surrounding cellular substance becomes condensed, and forms, as it were, a new capsule, which resists reduction, and which, when such reduction cannot be accomplished, supplies, in a certain degree, the office of the original joint, by the motion which it allows.

The majority of writers, and Bell in particular, advise, in this case, that no attempt at reduction should be made, as it would be useless in regard to the dislocation, and might be injurious to the patient, from the excessive stretching of parts. This was for some time the doctrine of Desault; but, in his latter years, experience led him to adopt a bolder practice.

Complete success, obtained in dislocations, which had existed from fifteen to twenty days, encouraged him to attempt reduction at the end of thirty, and thirty-five days, and, in the two years preceding his death, he succeeded, three or four times in reducing dislocations which had existed two months and a half, and even three months, both when the head of the bone was situated at the lower, and at the internal part of the scapula.

However violent or protracted the extension may have been, none of the terrible consequences with which, authors threaten us, ever occurred. One phenomenon, which it was difficult to foresee, and of which we shall speak presently only took place in two instances.

In these cases it is necessary, before making the extension, to move the bone about extensively in all directions, for the purpose of first breaking its adhesions, lacerating the condensed cellular substance, serving as an accidental capsule,

and of producing, as it were, a second dislocation, in order to remove the first. Extension is then to be made in the ordinary way, but with an additional number of assistants.

The first attempts frequently fail, and the dislocated head of the bone continues unmoved, notwithstanding the most violent efforts. In this case, after leaving off the extension, the arm is to be again moved about most extensively. The humerus is to be carried upward, downward, forward, and backward. Force the resistances. Let the arm describe a large segment of a circle, in the place where it is situated. Let it be once more rotated on its axis; then let the extension be repeated, and directed in every way. Thus, the head of the bone will be first disengaged by the free motion, and will afterwards be reduced.

In these cases, when the dislocation, in consequence of being very old, presents great obstacles in the way of reduction, even though the attempts made for this purpose should fail, they are not entirely useless. By forcing the head of the bone to approach the glenoid cavity, and even placing it before the cavity, and making it form new adhesions, after the destruction of the old ones, the motions of the arm are rendered freer. Indeed, they are always the less obstructed, the nearer the head of the bone is to its natural situation.

3. *Contractions of the Muscles.*

A third impediment to the reduction of every kind of dislocation, is the power of the muscles, which is augmented beyond the natural degree, in consequence of their being on the stretch. Sometimes, this power is so considerable, that it renders the head of the bone immoveable, though the most violent efforts are made. Here the means to be adopted are such as weaken the patient, bleeding, the warm bath, &c. Extension unremittingly, but not violently, continued for a length of time, will ultimately fatigue the resisting muscles, and overcome them with more safety and efficacy, than could be accomplished by any sudden exertion of force.

The swelling about the joint, brought on by the accident, usually disappears without trouble.

Another consequence, which seldom occurs in practice, concerning which, authors have scarcely said any thing, and which Desault several times had occasion to observe, is a considerable emphysema, suddenly originating at the time of reduction. In the middle of such violent extension, as the long standing of the dislocation re-

quires, a tumour suddenly makes its appearance under the great pectoral muscle. Rapidly increasing, it spreads towards the arm-pit, the whole extent of which it soon occupies. It spreads backward, and, in a few minutes, sometimes becomes as large as a child's head. A practitioner, unacquainted with this accident, might take it for an aneurism, occasioned by the sudden rupture of the axillary artery, from the violent extension. But, if attention be paid to the elasticity of the tumour, to its fluctuation, to the situation where it first appears, commonly under the great pectoral muscle, and not in the axilla; to the continuance of the pulse; and to the unchanged colour of the skin; the event may easily be discriminated from any rupture of the artery. (*Œuvres Chirurg. de Desault, par Bichat, Tom. 1.*)

The saturnine lotion, and gentle compression with a bandage, are the most advantageous means for dispersing the above kind of swelling.

I shall conclude the subject of luxations of the shoulder with the following singular observation recorded by M. Larrey.

"Among the curious anatomical preparations, (says he) which I saw in the cabinet of the University of Vienna, there was a dissected thorax, shewn to me by Professor Prokaska, in which the whole orbicular mass of the head of the right humerus, engaged between the second and third true ribs, projected into the cavity of the chest. This singular displacement was the result of an accidental luxation occasioned by a fall on the elbow, while the arm was extended and lifted from the side. The head of the humerus, after tearing the capsular ligament, had been violently driven into the hollow of the axilla, under the pectoral muscles, so as to separate the two corresponding ribs, and pass between them. The diameter of the head of the bone surmounted this obstacle, and penetrated entirely into the cavity of the thorax, pushing before it the adjacent portion of the pleura. Every possible effort was made in vain to reduce this extraordinary dislocation. The urgent symptoms, which arose were dissipated by bleeding, warm bathing, and antiphlogistic remedies. The arm, however, remained at a distance from the side, to which condition, the patient became gradually habituated, and, after several years of suffering and oppression, he at length experienced no inconvenience. The patient was about sixteen or seventeen, when he met with the accident; and he lived to the age of thirty-one, when he died of some disease, which had no concern with the dislocation. His physicians were anxious to ascertain the nature of

this curious case, of which they had been able to form only an imperfect judgment. They were much surprised to find, upon opening the body, the head of the humerus lodged in the chest, surrounded by the pleura, and its neck closely embraced by the two ribs above specified. They were still more astonished to find, instead of a hard spherical body covered with cartilage, only a very soft membranous ball, which yielded to the slightest pressure of the finger. The cartilage and osseous texture of the whole portion of the humerus, contained within the cavity of the chest, had entirely disappeared. *Les absorbans s'en étaient emparés, (says M. Larrey) et comme autant de gardiens fidèles, ils avaient cherché à détruire par portions, n'ayant pu l'expulser en masse, un ennemi qui s'était furtivement introduit dans un domicile où sa présence devait être impolite et nuisible.* Of the humerus, there only remained some membranous rudiments of its head, and a great part of these seemed to belong to the pleura costalis." (See *Larrey's Mémoires de Chirurgie Militaire, Tom. 2, p. 405—407.*)

DISLOCATION OF THE FORE-ARM FROM THE HUMERUS.

Notwithstanding the extent of the articular surfaces of the radius and ulna with the os humeri, the strength of the muscles and ligaments surrounding the joint, and the mutual reception of the eminences, which makes it a perfect angular ginglymus, a dislocation of these two bones off the humerus, may take place at the same time. They are most frequently luxated backward; sometimes laterally, but very rarely forward: the latter luxation cannot occur without a fracture of the olecranon. Indeed, it is so uncommon, that neither Petit nor Desault ever met with it. The luxation backwards is facilitated by the small size of the coronoid process, which may slide behind the humerus, when this is forcibly pushed downwards and forwards, and ascend as high as the cavity, which receives the olecranon during the extension of the fore-arm.

Luxations laterally are much less frequent, and are always incomplete. The great extent of the articular surfaces in the transverse direction, the reciprocal union of their unequal ties, and especially the strength of the ligaments and muscles, which, arising from the internal and external condyles of the inferior extremity of the humerus, go to the fore-arm and hand, give great strength to the articulation, and render it impossible to effect by any violence, a complete luxation laterally.

In the luxation backwards, the radius

and ulna may ascend more or less behind the humerus; but the coronoid process of the ulna is always carried above the articular pulley, and is found lodged in the cavity destined to receive the olecranon. The head of the radius is placed behind and above the external condyle of the humerus. The annular ligament, which confines the superior extremity of the radius to the ulna, may be lacerated: in which case, even when the bones are reduced, it is difficult to keep them in their proper places, as the radius tends constantly to separate from the ulna.

This luxation always takes place from a fall on the hand; for, when we are falling, we are led by a mechanical instinct to bring our hands forwards to protect the body. If in this case the superior extremity, instead of resting vertically on the ground, be placed obliquely with the hand nearly in a state of supination, the repulsion which it receives from the ground will cause the two bones of the fore-arm to ascend behind the humerus, whilst the weight of the body pressing on the humerus, directed obliquely downwards, forces its extremity to pass down before the coronoid process of the ulna.

The fore-arm, in this luxation, is in a state of half-flexion, and every attempt to extend it occasions acute pain. The situation of the olecranon, with respect to the condyles of the humerus, is changed. The olecranon, which, in the natural state, is placed on a level with the external condyle, which is itself situated lower than the internal, is even higher than the latter.

This luxation may be mistaken for a fracture of the olecranon, of the head of the radius, or even of the inferior extremity of the humerus. Such a mistake is attended with very bad consequences; for, if the reduction be not effected before the end of fifteen or twenty days, it is often impossible to accomplish it afterwards. The swelling which supervenes in twenty-four hours after the accident, renders a diagnosis more difficult; but the olecranon and internal condyle, are never so obscured, that the distance between them cannot be found to be increased, though Boyer makes a contrary assertion. It is true, that the rubbing of the coronoid process and olecranon against the humerus, may cause a grating noise, similar to that of a fracture; and some attention is certainly requisite to establish a diagnosis between a fracture of the head of the radius, and a dislocation of the fore-arm backwards.

The following method of reducing the case is advised by Boyer:—The patient

being firmly seated, an assistant is to take hold of the middle part of the humerus, and make the counter-extension, while another assistant makes extension at the inferior part of the fore-arm. The surgeon, seated on the outside, grasps the elbow with his two hands, by applying the fore-fingers of each to the anterior part of the humerus, and the thumbs to the posterior, with which he presses on the olecranon, in a direction downwards and forwards. This method will be in general successful. If the strength of the patient, or the long continuance of the luxation, render it necessary to employ a greater force, a fillet is to be applied on the wrist, to make extension, and a cushion is to be placed in the axilla, and the arm and trunk fixed, as is done in cases of luxation of the humerus.

A bandage may afterwards be applied, in the form of a figure of 8, and the arm is to be kept in a sling. The laceration which always takes place, is invariably followed by more or less swelling, which is to be combated by antiphlogistic means.

At the end of seven or eight days, when the inflammatory symptoms are nearly gone, the articulation is to be gently moved, and the motion is to be increased every day, in order to prevent an anchylosis, to which there is a great tendency.

In this luxation, the annular ligament which confines the head of the radius to the extremity of the ulna, is sometimes torn, and the radius passes before the ulna. In such cases, pronation and supination are difficult and painful, though the principal luxation has been reduced. The head of the radius may be easily replaced, by pressing it from before backwards, and it is to be kept in its place by a compress, applied to the superior and external part of the fore-arm. The bandage and compresses are to be taken off every two or three days, and re-applied. This is necessary, on account of the necessity of moving the articulation to prevent an anchylosis.

If the luxation be not soon reduced, it becomes irreducible; the heads of the radius and ulna grow to the back part of the humerus, and the patient can neither bend nor extend his arm. However, in certain cases, especially in young persons, some motion is acquired in time; the heads of the radius and ulna making in the humerus cavities, in which they perform some motions, but always imperfectly.

The luxation forwards should be treated as a fracture of the olecranon, with which it would be inevitably accompanied. It may be necessary, on account of the great injury done to the soft parts, to bleed the

patient copiously, and put him on an antiphlogistic regimen.

As to the lateral luxations, either inwards or outwards, they are always incomplete, and easily discovered. They are reduced by drawing the humerus and fore-arm in contrary directions, and at the same time pushing the extremity of the humerus, and the two bones of the fore-arm in opposite directions.

These luxations cannot be produced without considerable violence; but when the bones are reduced, they are easily kept in their place. It will be sufficient to pass a roller round the part, to put the fore-arm in a middle state, neither much bent nor extended, and to support it in a sling. But much inflammation is to be expected from the injury done to the soft parts. In order to prevent it, or at least mitigate it, the patient is to be bled two or three times, and put on a low diet, and the articulation is to be covered with the *lotio aq. litharg. acet.* Boyer, however, has recommended emollient cataplasms. It is scarcely necessary to repeat, that the arm is to be moved as soon as the state of the soft parts will admit of it. (*Boyer's Leçons sur les Maladies Des Os, Tom. 2.*)

The dislocation of the fore-arm backward, is said to occur ten times as frequently as lateral luxations; and those forward are so rare, that no comparison whatever can be drawn. (*Œuvres Chirurgicales de Desault par Bichat, Tom. 1.*)

Lateral luxations have been divided into *complete*, that is, when the articular surfaces have entirely lost their state of reciprocal contact; and into *incomplete*, that is, when only one bone, or a part of it, is thrown off the humerus. But, what cause can operate with sufficient force to produce the first occurrence? The mischief would also be so great, were such a case to happen, that amputation would most likely be requisite.

The incomplete lateral luxation may be produced by a blow, which drives the upper part of the fore-arm violently outward, or inward. A footman, says Petit, in falling from a coach, had his arm entangled in the spokes of a wheel, and a dislocation outward was the consequence. Another man luxated his fore-arm inward, by falling from his horse and driving his arm against an uneven place.

When the ulna is pushed into the situation of the radius, the space, between the olecranon and internal condyle, is much greater, than is natural. These points of bone are always very distinguishable, let the joint be ever so much swollen; and hence, the information to be derived from an examination of them, may be obtained

in every case, without exception. Also, when the ulna is pushed into the place of the radius, the latter bone cannot be easily rotated, nor can the fore-arm be bent, and extended, in a perfect manner.

The dislocation inward must be very uncommon, as the form of the bones is almost an insurmountable obstacle to such an accident. It may happen, however, as the authority of Petit confirms.

All recent dislocations of the elbow are very easily reduced, and as easily maintained so; for the reciprocal manner in which the articular surfaces receive each other, and their mutual eminences and cavities, will not readily allow the bones to become displaced again.

The application of a bandage in the form of a figure of 8, and supporting the arm in a sling, are proper in all these cases.

DISLOCATION OF THE RADIUS FROM THE ULNA.

The majority of authors, who have written on dislocations of the fore-arm, have not separately considered those of the radius. Some detached observations, on luxations of its superior extremity, are to be found here and there; a subject, which Duverney alone has fully treated of. The dislocations of its lower end, which are more frequent, and easy of occurrence, have almost escaped the notice of French, and, also, English writers. At present, cases of this sort have been so numerous collected, that a particular account of them may be offered.

DIFFERENCE OF STRUCTURE, BETWEEN THE TWO JOINTS OF THE RADIUS WITH THE ULNA.

The radius, the moveable agents of pronation and supination, rolls round the ulna, which forms its immoveable support, by means of two articular surfaces; one above, slightly convex, broad internally, narrow outwardly, and corresponding to the little sigmoid cavity of the ulna, in which it is lodged; the other below, concave, semicircular, and adapted to receive the convex edge of the ulna. Hence, there are two joints, differing in their motions, articular surfaces, and ligaments. By ascertaining such differences, we shall be enabled to find out those, which exist between the luxations of the upper and lower head of the radius.

Above, the radius, in pronation and supination, only moves on its own axis; below, it rolls round the axis of the ulna. Here, being more distant from the centre, its motions must be both more extensive

and powerful, than they are above. The head of the radius, turning on its own axis in the annular ligament, cannot dis-tend it in any direction. On the contrary, below, the radius, in performing pronation, stretches the posterior part of the capsule, and presses it against the im-moveable head of the ulna, which is apt to be pushed through, if the motion be forced. A similar event, in a contrary sense, takes place in supination. The front part of the capsule, being rendered tense, may now be lacerated.

Add to this disposition, the difference of strength between the ligaments of the two joints. Delicate, and yielding below; thick, and firm, above; their difference is very great. The upper head of the radius, supported on the smaller immoveable articular surface of the ulna, it is protected from dislocation in most of its motions. On the contrary, its lower end, carrying along with it, in its motions, the bones of the carpus, which it supports, cannot itself derive any solid stability from them.

DIFFERENCES OF DISLOCATIONS OF THE RADIUS.

From what has been said, the following conclusions may be drawn: 1. That with more causes of luxation, the lower articulation of the radius has less means of resistance; and, that under the triple consideration of motions, ligaments tying the articular surfaces together, and the relations of these surfaces to each other, this joint must be very subject to dislocation. 2. That, for opposite reasons, the upper joint cannot be very subject to such an accident.

Indeed, what could be the cause producing it in this situation? Can it arise from a violent pronation, or supination? The lower joint being the weakest, would give way the first, and, however forcible any motion of this kind might be, the upper head of the radius would only be rotated on its own axis. How then can this part be dislocated, without being pushed forward, or backward? All the muscular and ligamentous support of the joint must be broken; and the muscles and ligaments are too strong to admit of this, and the motion itself too feeble. Can the accident originate from any impulse on the radius, from below upward. The immoveable resisting end of the humerus would then prevent the radius from quitting the capsular ligament. Can the accident arise from a violent extension, or flexion of the fore-arm. Here the whole force operating on the ulna, the radius scarcely feels the impulse.

Hence, accidental dislocations of the radius, suddenly produced by an external cause, must, if they ever happen, be exceedingly uncommon at its upper end. This is not the case, with respect to such dislocations, as occur slowly at this joint, especially in children, in whom the ligaments become lax in consequence of repeated efforts. With this kind of case, we have here nothing to do.

Experience sometimes seems to militate against the above reflections. Du-verney quotes some instances of dislocations of the radius, suddenly produced by external causes. Some other practitioners mention similar examples. But, in their examinations, have these men paid all due attention? An analogous case has been transmitted to the French Academy of Surgery, by one of its fellows; but, doubts have arisen concerning its reality, and there are too few facts for, and too much presumptive evidence against, the truth of such cases, for their existence to be believed. Desault himself rejected their reality.

DISLOCATION OF THE LOWER END OF THE RADIUS.

The causes are the same, as those of all analogous cases. 1. Violent action of the pronator and supinator muscles. This is, doubtless, a very unusual cause, for Desault never knew an instance of it. 2. External force, moving the radius violently into a state of pronation, and rupturing the back part of the capsule; or into a state of supination, and breaking the front part of the capsular ligament.

Hence, there are two kinds of dislocation; one forward, the other backward. The first is very frequent; the second is much less so. The latter case never presented itself to Desault, but once, in the dead body of a man, who had both his arms dislocated, and no particulars could be learnt. The other case occurred very often in the practice of this eminent surgeon. Five examples have been published. Doubtless, this difference is owing to all the principal motions of the radius being in the prone direction.

This observation is confirmed by the fact, that the lower joint of the radius, in the dead subject, may be dislocated as easily by a supine, as a prone motion of this bone.

The symptoms of the luxation forward are: 1. Constant pronation of the fore-arm: 2. An inability to perform supination, and great pain on this being attempted: 3. An unusual projection at the back of the joint, in consequence of the protrusion of the little head of the

ulna through the capsule: 4. The position of the radius is more forward, than natural: 5. Constant adduction of the thumb, which also is almost always extended: 6. A half-bent state of the fore-arm, and very often of the fingers. This, indeed, is the position, which the fore-arm usually assumes in all affections of its bones, and, in the present instance, the posture cannot be changed, without considerable pain: 7. More or less swelling around the joint. This sometimes comes on immediately after the accident, but always afterwards, if the reduction should remain unaccomplished. The condition of the joint may thus be obscured, and the accident mistaken for a sprain; as Desault often observed to have occurred with surgeons, who had been called to these accidents before him. The serious consequence of this mistake is, that no attempt at reduction is made, and the articular surfaces having time to contract adhesions, the disorder is frequently rendered irremediable.

A luxation of the radius backward is characterised by symptoms, the reverse of those above mentioned. They are, a violent supination of the limb; inability to put it prone; pain on making the attempt; a tumour in front of the fore-arm formed by the head of the ulna; a projection backward of the large head of the radius; and abduction of the thumb.

REDUCTION.

When the dislocation is forward, an assistant is to take hold of the elbow, raising the arm a little from the body; another is to take hold of the hand and fingers.

The surgeon is to take hold of the end of the fore-arm with both his hands; one applied to the inside, the other to the outside, in such a manner, that the two thumbs meet each other before, between the ulna and radius, while the fingers are applied behind. He is then to endeavour to separate the two bones from each other, pushing the radius backward and outward, while the ulna is held in its proper place. At the same time, the assistant, holding the hand, should try to bring it into a state of supination, and consequently the radius, which is its support. Thus pushed, in the direction opposite that of the dislocation, by two powers, the radius is moved outward, and the ulna returns into the opening of the capsule, and into the sigmoid cavity.

If chance should present a dislocation of the radius backward, the same kind of proceeding, executed in the opposite direction, would serve to accomplish the

reduction. (See *Œuvres Chirurgicales de Desault, par Bichat, Tom. 1.*)

DISLOCATIONS OF THE WRIST.

The carpal bones may be luxated from the lower ends of the radius and ulna forwards, backwards, inwards, or outwards. The two first cases, especially the one backwards, are the most frequent. The dislocation backwards is rendered easy by the direction of the convex articular surfaces of the scaphoid, semilunar, and pyramidal bones, which sloping more backwards than forwards, must make them more disposed to slip in this direction, than any other. The accident may be caused by a fall on the back of the hand, while much bent; in which event the first row of the carpal bones slide backwards into the oblong cavity of the radius, lacerate the posterior ligament, and form an eminence behind the lower ends of the bones of the fore-arm. This prominence, the depression in front of the wrist, and the extraordinary flexion of the hand, which cannot be extended, are the characteristic signs of this kind of dislocation. The dislocation forwards generally arises from a fall on the palm, the fingers being extended, and more force operating on the lower, than upper part of the palm. The luxation is seldom complete; and the hand remains painfully extended. The great many tendon, which runs before the wrist, and the annular ligament, being pushed forward, the prominence formed by the carpal bones, in front of the ends of the radius and ulna, is not easily detected, and the case may be mistaken for a sprain.

Dislocations inwards, or outwards, are never complete. The projection of the carpal bones at the inner, or outer side of the joint, and the distortion of the hand, make such cases sufficiently evident.

All dislocations of the wrist are very easy of reduction. For this purpose, gentle extension must be made, while the two surfaces of the joint are made to slide on each other in a direction contrary to what they took when the accident occurred.

Dislocations of the wrist are always attended with a great deal of spraining of numerous tendons, and laceration of ligaments, and consequently considerable swelling generally follows, and the patient is a long time in regaining the perfect use of the joint. To relieve the symptoms as much as possible, the best plan is to keep the hand and wrist continually covered with linen wet with the

saturine lotion, and to put the fore-arm and hand in splints, as in the case of a fracture. See *Fractures of the Fore-arm*. The arm must also be kept perfectly at rest in a sling.

When the ruptured ligaments have united, the use of liniments will tend to remove the remaining stiffness and weakness of the joint.

DISLOCATIONS OF THE BONES OF THE CARPUS AND METACARPUS.

A dislocation of the carpal bones from each other seems almost impossible. The os magnum, however, has been known to be luxated from the deep cavity formed for it by the scaphoides and semilunare, in consequence of too great a flexion of the bones of the first phalanx on those of the second, and it formed a tumour on the back of the hand. (*Chopart; Boyer; Richeraud.*)

The metacarpal bones are never luxated from each other. The first one is sometimes, though very rarely, pushed off the trapezium.

DISLOCATIONS OF THE FINGERS.

The first phalanges, may be dislocated backwards off the heads of the metacarpal bones. A luxation forwards would be very difficult, if not impossible, because the articular surfaces of the metacarpal bones extend a good way forwards, and the palm of the hand makes resistance to such an accident. The first phalanges of the thumb and little finger can alone be dislocated inwards; and the first phalanx of the thumb is alone subject to be luxated outwards. This phalanx is also most liable to dislocations backwards, behind the head of the first metacarpal bone, in which case it remains extended, while the second is bent.

These dislocations should be speedily reduced; for, after eight or ten days, they become irreducible. In a luxation of the first bone of the thumb, which was too old to be reduced, Desault proposed cutting down to the head of the bone, and pushing it into its place with a spatula. Dislocations of the thumb and little finger inwards, that of the thumb outwards, and luxations of the first phalanges of the other fingers backwards, are all reduced by making extension on the lower end of the affected thumb, or finger. The first and second phalanges may also be dislocated backwards.

After the reduction, the thumb, or finger, affected, should be rolled with tape, and incased, and supported in pasteboard, till the lacerated ligaments

have united; care being taken to keep the hand and fore-arm quietly in a sling.

DISLOCATIONS OF THE BONES OF THE PELVIS.

M. Louis, in Tom. 4, of the *Mém. de l'Acad. de Chirurgie*, 4to. relates a case, in which the os ilium of the right side was found separated from the sacrum, so as to pass nearly three inches behind it. This accident was caused by a very heavy sack of wheat falling on a labourer, and the truth of it was ascertained by dissection. Such a case must be exceedingly uncommon.

The os coccygis is not so easily dislocated, as fractured. Boyer, however, has seen it displaced in a man, who was greatly emaciated by disease. This subject had considerable ulcerations about the coccyx, and the bone itself was bare. There was an interspace of nearly two inches, between the sacrum and base of the os coccygis. In proportion as the man regained his strength the bone recovered its right position; and at length united to the os sacrum, notwithstanding the action of the levatores ani, which are inserted into it. (*Boyer.*) This case, however, was not an accidental luxation; and it clearly arose from the destruction of the ligaments by disease.

Authors mention two kinds of dislocation, to which the os coccygis is liable, one inward, the other outward. The first is always occasioned by external violence; the second, by the pressure of the child's head in difficult labours. The nature of these accidents is easily discovered by the preceding cause, and by an examination with the fingers, externally, and within the rectum. Pain, difficulty of voiding the fæces and urine, tenesmus, and inflammation, sometimes ending in abscesses, which interest the rectum, are symptoms, said to attend and follow dislocations of the os coccygis.

These luxations are easily reduced, by means of a finger in the rectum, assisted by the other fingers externally. No more can be done than in the case of a fracture. (*See Fracture.*)

DISLOCATION OF THE RIBS.

J. L. Petit was silent on this subject, as he thought such cases never occurred. Since his death, a French surgeon, Buttet, has related an instance, which he supposed to be a dislocation of the posterior extremity of the rib from the vertebræ; but, Boyer clearly shews he had no true reasons for this opinion, and that

the case was only a fracture of the neck, or end of the bone, near the spine.

Ambrose Paré, Barbette, Junker, Platner, and Heister, not only admit the occurrence of luxations of the ribs; but, describe different species of them. Lieutaud also termed cases, in which the head of the rib was separated by disease, luxations. On the whole, we may conclude, that the ribs are so rarely dislocated, that the subject is not deserving of much attention in this work.

DISLOCATIONS OF THE THIGH-BONE.

The head of the thigh-bone may be dislocated upwards and outwards on the dorsum of the ilium; upwards and forwards on the body of the os pubis; downwards and inwards on the foramen ovale; and downwards and outwards on the os ischium.

The dislocation upwards and outwards, and the one downwards and inwards, are the most frequent. First, of luxations on the ilium.

The common kind of dislocation of the thigh-bone, upward and outward, is attended with the following symptoms. The affected thigh is shorter, than its fellow, is a little bent, and carried inwards. The knee inclines more forwards and inwards, than the opposite one; the leg and thigh are turned inwards, and the foot points in this direction. The trochanter major is brought nearer the anterior superior spinous process of the os ilium, and is at the same time elevated and carried a little forwards. The natural length of the limb cannot be restored, without reducing the luxation; the foot cannot be turned outwards, and any attempt to do so causes pain; but, the inclination of the foot inwards may be increased. (*Boyer*)

This luxation has nothing in common with a fracture of the neck of the thigh-bone, except the shortness of the limb. The cases are at once discriminated by this difference, that, *in this kind of luxation, the limb and toes are turned inwards, while in all fractures of the thigh-bone, they are invariably turned outwards.*

Many writers have been puzzled how to account for the toes being inclined inwards. We have only to reflect, however, that the trochanter major is situated forwards, and that the head of the bone lies backwards, when we shall immediately perceive, that the limb is mechanically prevented from being rotated outwards.

To reduce this dislocation, the patient should be placed on his opposite side upon a table firmly fixed, or a large four-

posted bedstead. A sheet, folded longitudinally, is first to be placed under the perineum, and one end being carried behind the patient, the other, before him, they are to be fastened to one of the legs, or posts of the bed. Thus the pelvis will be fixed, so as to allow the necessary extension of the thigh-bone to be made. Great care must be taken during the extension to keep the scrotum and testicles from being hurt, or the pudenda in women, by the sheet passed under the perineum. The patient must be further fixed by being held by assistants.

The best practitioners of the present day in France, advise the extending force to be applied to the inferior part of the leg, in order to have it as far as possible from the parts, which resist the return of the head of the bone into its natural situation. In this country, surgeons generally prefer making the extension by means of a sheet, fastened round the limb just above the condyles of the os femoris. As soon as the head of the bone has been brought on a level with the acetabulum by the assistants, who are making the extension, the surgeon is, to force it into this cavity by pressing on the great trochanter.

The extension should always be made in a gradual and unremitting manner: at first, gently; but afterwards more strongly; yet never violently. The difficulty of reduction arises from the great power and resistance of the muscles, and these must at length be fatigued, so as to yield to the extending force, if care be taken, that it be maintained the necessary time, without the least intermission.

In very strong, athletic subjects, it may be proper to bleed them, in order to produce a temporary weakness, for the purpose of facilitating the reduction.

The disappearance of all the symptoms, and the noise made by the head of the bone, when it slips into the acetabulum, denote, that the reduction is effected. The bone is afterwards to be kept from slipping out again, by tying the patient's thighs together with a bandage placed a little above the knees. The patient should be kept in bed at least three weeks; live low, and rub the joint with the *linimentum cumph. et saponis*. Due time must be given for the lacerated ligaments to unite, and the sprained parts to recover; and premature exercise may bring on irremediable disease in the joint.

Mr. Hey gives the following directions, and description of the way, in which he reduced a case of this kind.

"The extension of the limb must be made in a right line with the trunk of the body; and, during the extension, the head of the bone must be directed out-

wards as well as downwards. A rotatory motion of the os femoris on its own axis, towards the spine, (the patient lying prone) seems likely to elevate the great trochanter, bring it nearer to its natural position, and direct the head of the bone towards the acetabulum. These circumstances led to the following method. A folded blanket was wrapped round one of the bed-posts, so that the patient, lying in a prone position, and astride of the bed-post, might have the affected limb on the outside of the bed. The bed was rendered immoveable, by placing it against a small iron pillar, which had been fixed for the purpose of supporting the curtain rods. The leg was bent to a right angle with the thigh, and was supported in that position by Mr. Lucas, who, when the extension should be brought to a proper degree, was to give the thigh its rotatory motion, by pushing the leg inwards, that is, towards the other inferior extremity. Mr. Jones sat before the patient's knee, and was to assist in giving the rotatory motion, by pushing the knee outwards at the same moment. I sat by the side of the patient, to press the head of the bone downwards and outwards during the extension. Two long towels were wrapped round the thigh just above the condyles, one towel passing on the inside of the knee, the other on the outside. Three persons made the extension; but when we attempted to give the thigh its rotatory motion, we found it confined by the towel which passed on the inside of the knee and leg. We therefore placed both the towels on the outside; and in this position the extending force concurred in giving the rotatory motion. The first effort that was made, after the towels were thus placed, had the desired effect, and the head of the bone moved downwards and outwards into the acetabulum." (*Hey's Practical Observations*, p. 313.)

There is another kind of dislocation upward and outward, so rare, that many experienced men have never seen it, and few have mentioned it. I allude to the case, in which the head of the thigh-bone is so situated on the dorsum of the ilium, that it lies forward, the trochanter major backward, and an instance of which I have myself seen in St. Bartholomew's hospital. This case deserves very particular attention, because being attended with a considerable turning of the toes outwards, as well as a shortening of the limb, it is the only example, which is at all likely to be mistaken for a fracture of the neck of the thigh-bone. The case, however, is not difficult of detection; for, you can even feel the head of the bone projecting forward on the ilium, and you

cannot rotate the limb inwards, which can be done in cases of fracture, though doing so is productive of immense suffering.

This rare kind of luxation is to be reduced by the same means, and in the same manner, as the common dislocation upwards and outwards, already treated of.

Another of the most frequent luxations of the thigh-bone, is downwards and inwards, upon the obturator foramen. The occurrence of this accident is facilitated by the great extent of the motion of abduction of the thigh; by the notch at the inferior and internal part of the acetabulum; by the weakness of the orbicular ligament on this side; and by the ligamentum teres not opposing, nor being necessarily ruptured by it. The head of the bone is thrown between the obturator ligament, and obturator externus muscle.

The symptoms are as follow: the affected thigh is longer, than the sound one; the head of the femur being situated lower than the acetabulum, the trochanter major is removed to a greater distance from the anterior superior spinous process of the ilium, and the thigh is flattened, in consequence of the elongation of the muscles. A hard, round tumour is felt at the inner and superior part of the thigh, formed by the head of the femur. The leg is slightly bent; and the knee and foot, are turned outwards, and cannot be brought back into their proper direction.

This case, like a fracture, is attended with a turning of the toes outwards; but, besides being easy of discrimination on every account, the elongation of the limb at once denotes, that there is no fracture, which always causes a shortening of the member.

Dislocations on the obturator foramen, are very easy of reduction. The extension is to be made downwards and outwards, so as just to dislodge the head of the bone, and then the muscles generally draw it into the acetabulum, on the extending force being gradually relaxed, and the surgeon pushing the upper part of the bone outward.

The thigh-bone is sometimes, though very seldom, luxated upwards and forwards, into the groin. The whole limb is turned outwards and shortened; the trochanter major is approximated to the anterior superior spinous process of the ilium; the head of the bone forms a tumour in the groin, and, pressing on the anterior crural nerves, causes great pain, numbness, and even paralysis; and the knee is carried backwards.

The head of the bone felt in the groin; the inclination of the knee backwards; and the impossibility of rotating the limb

inward; distinguish it from a fracture of the neck of the bone.

It is reduced in the same way, as the luxation downwards and forwards.

Mr. Hey says, that "In this species of dislocation, (downwards and forwards,) as the head of the bone is situated lower than the acetabulum, it is evident, that an extension made in a right line with the trunk of the body, must remove the head of the bone farther from its proper place, and thereby prevent, instead of assisting, reduction. The extension ought to be made with the thigh at a right angle, or inclined somewhat less than a right angle, to the trunk of the body. When the extension has removed the head of the bone from the external obturator muscle, which covers the great foramen of the os innominatum, the upper part of the os femoris must then be pushed or drawn outwards; which motion will be greatly assisted by moving the lower part of the os femoris, at the same moment, in a contrary direction; and, by a rotatory motion of the bone upon its own axis, turning the head of the bone towards the acetabulum." (*Hey*, 316.)

The ensuing case illustrates Mr. Hey's practice.

"The lower bed-post, on the right side of the bed on which the patient lay, was placed in contact with a small immoveable iron pillar (about an inch square in thickness,) such as in our wards are used for supporting the curtain rods of the beds. A folded blanket being wrapped round the bed-post and pillar, the patient was placed astride of them, with his left thigh close to the post, and his right thigh on the outside of the bed. A large piece of flannel was put between the blanket and the scrotum, that the latter might not be hurt during the extension.

"The patient sat upright, with his abdomen in contact with the folded blanket which covered the bed-post. He supported himself by putting his arms round the post, and an assistant sat behind him to prevent him from receding backwards. He was also supported on each side.

"Two long towels were put round the lower part of the thigh, after the part was well defended from excoriation by the application of a flannel roller. The knot, which the towels form, was made upon the anterior part of the thigh, that the motion intended to be given to the leg might not be impeded by the towels.

"The thigh being placed in a horizontal position, or rather a little elevated, with the leg hanging down at right angles to the thigh, I sat down upon a chair, directly fronting the patient, and directed a gentle extension to be made by the assist-

ants standing at my left side. This was done with the view of drawing the head of the bone a little nearer to the middle of the thigh, and the extension had this effect. I then placed the two assistants, who held the towels, at my right side, by which means the extension would be made in a direction a little inclined to the sound limb. Mr. Logan stood on the right side of the patient, with his hands placed on the upper and inner side of the thigh for the purpose of drawing the head of the bone towards the acetabulum, when the extension should have removed it sufficiently from the place in which it now lay.

"I desired the assistants to make the extension slowly and gradually; and to give a signal when it arrived at its greatest degree. At that moment, Mr. Logan drew the upper part of the bone outwards, while I pushed the knee inwards, and also gave the os femoris a considerable rotatory motion, by pushing the right leg towards the left. By these combined motions, the head of the os femoris was directed upwards and outwards, or in other words, directly towards the acetabulum, into which it entered at our first attempt made in this manner.

"The scrotum, as the patient assured me, was not hurt in the least by the extension." (*Hey*, p. 318.)

The last dislocation of the thigh remaining to be spoken of, is that downwards and backwards. The head of the bone rests against that part of the ossa innominata where the ilium and ischium join. The limb is turned outwards. When the luxation is primary, the extremity is lengthened. A hard tumour is felt at the posterior and inferior part of the buttock, and the great trochanter is removed further from the spine of the ilium. When secondary (which is far more frequent,) the primary luxation having been upwards and outwards, the foot is turned inwards. The primary luxation downwards and backwards, with the toes turned outwards, is as unusual, as the case upwards and backwards, with the foot in the same position. The lengthening of the limb, however, at once shews the case not to be a fracture.

The pelvis being fixed, as already described, the extension is to be made downwards and forwards, to dislodge the head of the bone, while the surgeon, with a napkin, placed just below the trochanter minor, pulls the upper part of the femur towards the acetabulum.

DISLOCATION OF THE PATELLA.

This bone may be luxated either inwards or outwards, when violently push-

ed in this direction. The luxation outward is the most frequent, because the bone more easily slips in this direction off the outer condyle of the femur, than inwardly. All these cases are easily reduced, on relaxing the extensors of the leg, and bending the thigh; but, owing to a relaxed state of the ligament of the patella, or other predisposing causes, the bone is sometimes difficultly kept in its proper situation, without applying a roller to the part. The inflammatory affection of the joint is to be opposed by bleeding, purging, and using the saturnine lotion. The joint must be kept quiet a few days, and then gently moved in order to prevent stiffness.

DISLOCATION OF THE KNEE.

The tibia may be luxated forward, backward, or to either side.

The dislocation backward is always incomplete, and sometimes is secondary, being a consequence of white swellings.

The luxation forward is even more rare, than the one backward. Dislocations inward, or outward, are the most frequent, and are always incomplete. The nature of all these cases is so conspicuous at first view, that there is no need of any detail of particular symptoms.

The bones of the leg are sometimes twisted outward, and the internal lateral ligament ruptured; but, this may happen without the crucial ligament being broken. On the other hand, when the bones of the leg are violently twisted inward, both the crucial ligaments, and external lateral ligament, must inevitably be ruptured.

These accidents are all most easily reduced, on making gentle extension, and pushing the head of the tibia in the proper direction. The grand object, after the reduction, is to avert inflammation of the knee, and promote the union of the torn ligaments. The first demands the rigorous observance of the antiphlogistic plan; both require the limb to remain perfectly motionless, supported by one, or two splints. As soon as the ligaments have grown together, and the danger of inflammation is over, which will be in about three weeks, the joint should be gently bent and extended a certain time every day in order to prevent stiffness. Liniments will now also be of service.

DISLOCATION OF THE FOOT.

The foot may be dislocated inwards, or outwards; forwards, or backwards; and either of these luxations may be complete, or incomplete. Dislocations inwards, and outwards, are the most common; the for-

mer occurring, however, more frequently, than the latter, which are greatly resisted by the lowness of the malleolus externus.

Many of these accidents are *compound*; that is, attended with a wound communicating with the joint; a circumstance that greatly increases the danger, and is frequently the occasion of the patient's losing his limb, and even his life. It is only, however, when the soft parts are very much contused, and extensively lacerated, that amputation should be had recourse to in the first instance. When the bones are reduced, and the edges of the wound brought into contact, the unpromising aspect of the case is very much diminished, and many, who might think amputation advisable at first view of the accident, would change their mind, as soon as the bones have been replaced.

Dislocations inwards, or outwards, are very easily reduced, and require very little extension. In accomplishing the reduction, it is best to relax the strong muscles of the calf by bending the leg on the thigh. The case is afterwards to be treated in the same way as a fracture of the leg.

Mr. Pott has called the attention of surgeons to a particular kind of dislocation, in which the utility of relaxing the muscles, is strikingly illustrated. I mean the instance, in which, "by leaping, or jumping, the fibula breaks in the weak part already mentioned, that is, within two or three inches of its lower extremity. When this happens, the inferior fractured end of the fibula falls inwards towards the tibia, that extremity of the bone which forms the outer ankle, is turned somewhat outward and upward, and the tibia having lost its proper support, and not being of itself capable of steadily preserving its true perpendicular bearing, is forced off from the astragalus inwards; by which means the weak bursal, or common ligament of the joint, is violently stretched, if not torn, and the strong ones, which fasten the tibia to the astragalus and os calcis, are always lacerated; thus producing at the same time a perfect fracture and a partial dislocation, to which is sometimes added, a wound in the integuments, made by the bone at the inner ankle. By this means, and indeed as a necessary consequence, all the tendons which pass behind or under, or are attached to the extremities of the tibia and fibula, or os calcis, have their natural direction and disposition so altered, that, instead of performing their appointed actions, they all contribute to the distortion of the foot, and that by turning it outward and upward.

“When this accident is accompanied, as it sometimes is, with a wound of the integuments of the inner ankle, and that made by the protrusion of the bone, it not unfrequently ends in a fatal gangrene, unless prevented by timely amputation; though I have several times seen it do very well without. But in its most simple state, unaccompanied with any wound, it is extremely troublesome to put to rights, still more so to keep it in order, and, unless managed with address and skill, is very frequently productive both of lameness and deformity ever after.

“After what has been said, a farther explanation why this is so, is unnecessary. Whoever will take even a cursory view of the disposition of the parts, will see that it must be so. By the fracture of the fibula, the dilatation of the bursal ligament of the joint, and the rupture of those which should tie the end of the tibia firmly to the astragalus and os calcis, the perpendicular bearing of the tibia on the astragalus is lost, and the foot becomes distorted; by this distortion the direction and action of all the muscles already recited are so altered, that it becomes (in the usual way of treating this case) a difficult matter to reduce the joint; and the support of the fibula being gone, a more difficult one to keep it in its place after reduction. If it be attempted with compress and strict bandage, the consequence often is a very troublesome, as well as painful ulceration of the inner ankle, which very ulceration becomes itself a reason why such kind of pressure and bandage can be no longer continued; and if the bone be not kept in its place, the lameness and deformity are such, as to be very fatiguing to the patient, and to oblige him to wear a shoe with an iron, or a laced buskin, or something of that sort, for a great while, or perhaps for life.

“All this trouble, pain, difficulty, and inconvenience, are occasioned by putting and keeping the limb in such position as necessarily puts the muscles into action, or into a state of resistance, which in this case is the same. This occasions the difficulty in reduction, and the difficulty in keeping it reduced; this distorts the foot, and by pulling it outward and upward makes that deformity which always accompanies such accident; but if the position of the limb be changed, if by laying it on its outside, with the knee moderately bent, the muscles forming the calf of the leg, and those which pass behind the fibula, and under the os calcis, are all put into a state of relaxation and non-resistance, all this difficulty and trouble do in general vanish immediately; the foot may easily be placed right, the joint reduced,

and by maintaining the same disposition of the limb, every thing will in general succeed very happily, as I have many times experienced.” (*Pott.*)

It occasionally happens in compound luxations of the ankle, that the astragalus only remains attached by a few fibres, in which circumstance, if it be judged prudent to attempt the preservation of the limb, it is best to imitate Ferrand and Desault, by extirpating this bone entirely, so as to allow the tibia to become ankylosed to the upper surface of the os calcis.

Dislocations forwards and backwards are not very common. The first case is the most difficult to produce.

The facility, with which all dislocations of the ankle are recognized by surgeons, acquainted with anatomy, renders a particular account of the symptoms quite superfluous.

Both the latter cases are easy of reduction, when care is taken to relax the muscles of the calf, which attention is most particularly essential to prevent the bones from becoming displaced again. The limb must be put in splints, just as if the case were a fracture.

The os calcis and astragalus are so intimately connected, that they are never completely luxated from each other. But, one, or both of these bones may be dislocated from the scaphoides and cuboides by violent force, when the forepart of the foot is fixed. (*J. L. Petit.*) The astragalus and os calcis, particularly the former, may then be luxated upwards into the cavity on the back of the scaphoides, so as to form a tumour on the back of the foot. The reduction is difficult: Boyer in one case could not succeed: but no lameness remained with the deformity.

The first phalanx of the great toe is sometimes dislocated from the first metatarsal bone. The reduction is too simple to need explanation.

On the subject of Dislocations, consult *Duverney's Traité des Maladies des Os. Leçons sur les Maladies des Os rédigées en un Traité complet de ces Maladies par Richerand, Tom. 2. Richerand's Nosographie Chirurgicale, Tom. 3. p. 193, &c. Edit. 2. Petit, Traité des Maladies des Os. Œuvres Chirurgicales de Desault, par Richat, Tom. 1. Pott's Remarks on Fractures and Dislocations. Hey's Practical Observations in Surgery. Kirkland's Observations upon Mr. Pott's General Remarks on Fractures, &c. White's Cases in Surgery. Medical Observations and Inquiries, Vol. 2. Bromfield's Chirurgicale Cases and Observations. Leveillé, Nouvelle Doctrine Chirurgicale, Tom. 2. Callisen, Systema Chirurgie Hodiernæ, Tom. 2. Desault's Journal de Chirurgie.*

DISTICHA, or **DISTICHIASIS**. (from *dis*, twice, and *stichos*, a row.) Gorrhæus,

Heister, and St. Ives, agree in applying this term to an affection of the eyelids, in which each tarsus has a double row of eye-lashes, which, inclining inward, irritate the eye, and keep up an ophthalmia. Such authors speak of this, as a very frequent complaint; but, the author of the present article in the *Encyclopédie Méthodique, Partie Chirurgicale*, remarks, that he has never met with it at all, though in ulcerations of the eyelids, he has often seen a certain number of the eye-lashes incline inward, and cause a good deal of disturbance to the eye, already in a state of inflammation. This disorder cannot be called the true distichiasis. However it may be, all writers recommend plucking out such eye-lashes, as assume an unnatural direction. A few of the hairs are to be taken out at a time, one after the other, and a few days are to be allowed to elapse, before this trivial operation is to be repeated. In order that the eye-lashes may be, with more certainty, extirpated to their roots, and that others may not grow in the same situation, it is advised to touch the places, from which they grow with the *argentum nitratum*. (See *Trichiasis*.) *Encyclopédie Méthodique, Partie Chirurgicale*.

DISTORTION. (from *distorqueo*, to wrest aside.) *Distortio*. The bones of the limbs frequently become distorted, in consequence of an unhealthy, rickety, or scrofulous constitution. Sometimes, they are deformed merely by the contraction of the muscles; and, very frequently, they are naturally distorted by the feet being either turned too much outward, or inward. Mere weakness will sometimes occasion a distortion; for when a child is too soon put to walk, its legs will become crooked from the bones not being strong enough to bear the weight of the body.

Distortions of the limbs are much more easily cured, than those of the spine. As they appear in infancy, when the bones are flexible, they can easily be brought into their proper shape by using machines, sometimes of a very simple kind; but it must always be remembered, that, as the disease, in cases, in which the limbs are not naturally distorted from birth, proceeds from weakness, we must not omit to strengthen the system by tonics. Sometimes, a gentle and long continued pressure will be sufficient to make a bone straight; but, generally, some kind of machines, or shoes, or boots, of a particular construction, are necessary.

When the limbs are distorted, by reason of a contraction of the muscles, emollient oils are highly recommended. The muscles and tendons, which are supposed

to cause the deformity, are to be rubbed throughout their course, for half an hour, or more, three times a day, during which frequent endeavours must be made to extend the limb; but, gradually, and without violence.

Latta's System of Surgery, Vol. 2, 467, 468. See Mollities Ossium; Rachitis; Vertebrae, Diseased; Vari and Valgi.

DOLOIRES. The spiral turns of a roller.

DURA MATER, FUNGOUS TUMOURS OF. The dura mater, the outer membrane of the brain, was so named by the ancients, on account of its hardness, and its being formerly supposed to be the source of all the other membranes of the body.

Fungous tumours of the dura mater, which have only had their nature understood about half a century, have not, however, escaped the notice of the ancient writers; but, the disease is very imperfectly described by them, and under an erroneous denomination. They supposed, that the swelling was of the encysted kind, or what they termed *natta, talpa, testudo*, and that it gradually altered and destroyed the cranium. They sometimes mistook the fungous, or sarcomatous tumour of the dura mater for coagulated blood, or for ill-conditioned excrescences, like those which make their appearance on ulcers attended with caries. Such are the ideas, which seem to be conveyed by some imperfectly detailed cases in the writings of Lanfranc, Guido di Cauliaco, Theodoricus, and other authors of the thirteenth and fourteenth centuries. Amatus Lusitanus has given the appellation of *lupus* with caries to a fungous tumour of the dura mater. The swelling occurred in a child eight years old, who died in convulsions, two days after an opening had been made in it.—(*Centur. 5, obs. 8*.) Another similar case, which happened in a child, and was noticed by Camerarius at Paris, is styled a singular bony excrescence. (*Ephemer. curios. natur. decur. 2, ann. 6, 1687, obs. 99*.) Lastly, Cattier, a physician of Montpellier, has recorded the history of a lady, who died from the consequences of a fungous tumour of the dura mater. The disease was so acutely painful, as to compel the patient to cry out. The swelling was opened with caustic. Pimprenelle, a Parisian surgeon, recommended the trepan to be employed; but, his advice was over-ruled. After death, a fungous of the dura mater, with a perforation in the skull, was detected, and it is described by the author as a hard, stony, substance, accompanied with points and

asperities. (*Obs. Med. obs.* 15, p. 48 — See *Iassus, Pathologie Chirurgicale, Tom.* 1, p. 498. *Edit.* 1839.)

The old surgeons, being ignorant of the real character of fungous tumours of the dura mater, and often to commit the most serious and fatal mistakes in the treatment. These diseases are of a chronic nature, and make their appearance gradually, in the form of a tumour, which makes its way through the bones of the cranium, rises up, and insensibly blends itself with the integuments, which seem, as it were, to make a part of it. Such fungous tumours of the dura mater may originate spontaneously at any part of this membrane; but, they are particularly apt to grow on the surface, which is adherent to the upper part of the skull, or to its basis. They are firm, indolent, and chronic, seeming as if they were the consequence of slow inflammation, affecting the vessels which supply the dura mater, and inosculate with those of the diploe. It is very difficult, one might say, impossible, to determine, whether in an affection of this kind, the disease begins in the dura mater, or the substance of the bone itself. The general belief, however, is, that the bone is affected secondarily, and the disorder originates in the dura mater. The patient, who is the subject of the first case, related in a memoir by M. Louis, had received no blow upon the head, and, could only impute his complaint to a fall, which he had met with four, or five months before, and in which the head had not struck against any thing; but, from this time, he experienced a stunning sensation, which continued till he died. The cranium and dura mater were found both equally diseased. Though this case may tend to shew, that fungous tumours of the dura mater may form spontaneously, yet it is not the less confirmed by the examination of a vast number of cases, that this affection more frequently follows blows on the head, than any other cause. Hence, a slow kind of thickening of the dura mater is produced, which ends in a sarcomatous excrescence, the formation of which always precedes the destruction of the bone. In the memoir, published by M. Louis, in the fifth volume, 4to. of those of the Royal Academy of Surgery, there is a very interesting case, illustrating the nature of the present disease.

The subject was a young man, aged twenty-one, who had a considerable tumour on the left side of the head, which was taken for a hernia cerebri. (*See this Article.*) The swelling had begun in the region of the temple, and had gradually acquired the magnitude of a second head.

The external ear was displaced by it, and pushed down as low as the angle of the lower jaw. At the upper part of the circumference of the base of the tumour, the inequalities of the perforated bone, and the pulsations of the brain, could be distinctly felt. Some parts of the mass were elastic and hard, others were soft and fluctuating. A plaster, which had been applied, brought on a suppuration at some points, from which an ichorous matter was discharged. Shiverings and febrile symptoms ensued, and the man died in less than four months, in the year 1764. On dissection, a sarcomatous tumour of the dura mater was detected, together with a destruction of the whole portion of the skull, corresponding to the extent of the disease.

When a tumour of this nature has decidedly formed, it makes its way outward through all the parts, soft or hard, which are opposed to it. The swelling, in becoming circumscribed, is partly blended with the dura mater, and its pressure produces an absorption of such parts of the skull, as oppose its enlargement. It unexpectedly elevates itself externally, confounding itself with the scalp, and presents itself outwardly in the form of a preternatural, soft, yielding swelling, which even sometimes betrays an appearance of a decided fluctuation, or a pulsation, which leads some to suppose it to be an aneurismal tumour. When once the swelling has made its exit from the cavity of the cranium, it expands on every side under the integuments, which readily make way for its growth. The scalp becomes distended, smooth, and œdematous over the extent of the tumour, and lastly it ulcerates. The matter, which is discharged from the ulcerations, is thin and sanious; the outer part of the tumour is confounded with the integuments and edges of the skull, on which it rests, so that, in this state, it easy to mistake the tumour for one, whose base is altogether external. While the swelling thus increases in size externally, it also enlarges internally. The latter change takes place in particular, while the opening in the cranium is not large enough to admit the whole mass of the tumour, which then depresses the brain, and lodges in the excavation, which it forms for itself. But, this cavity quickly diminishes, and becomes reduced almost to nothing, as soon as the tumour projects outwardly. The tables of the skull are absorbed to make way for the swelling to arrive externally; but, it is remarked, that the internal, or vitreous table, is always found much more extensively destroyed, than the external one. Some-

times, new bony matter is found deposited around the opening in the cranium.

It is asserted, that, whatever may be the situation of a fungous tumour of the dura mater, the outer layer of this membrane, upon which the disease forms, is alone altered, the inner layer and the pia mater being always unchanged. (*Lassus, Pathologie Chirurgicale, Tom. 1, p. 501. Edit. 1809.*)

According to surgical writers, fungous tumours of the dura mater have been caused by contusions of the skull, falls on the buttocks, concussions of the head or whole body, lues venerea, scrofula, inveterate rheumatism, &c. The three last of the alledged causes, however, seem to be little better than mere conjecture.

Children of the most tender years are even liable to the disease. M. Louis had related, that a child, two years of age, died of a fungus of the dura mater, which had produced a swelling above the right ear, attended with a destruction of a portion of the parietal and temporal bones. (*Mém de l'Acad. de Chirurgie, Tom. 5, 4to. p. 31.*)

The existence of a fungous tumour of the dura mater cannot be ascertained, as long as there is no external change. The effects produced, may originate from so many causes, that there would be great risk of a gross mistake in referring them to any particular ones. This is not the case, when there is an opening in the skull. Then a hardness, felt from the very first at the circumference of the tumour, denotes that it comes from within. When the swelling is carefully handled, such a crackling sensation is perceived, as would arise from touching dry parchment stretched over the skin. On making much pressure, pain is occasioned, and sometimes a numbness in all the limbs, stupefaction, and other more or less afflicting symptoms. The tumour, in some measure, returns inwards, especially, when not very large, and gradually rises up outward again, when the pressure is discontinued. Sometimes, there is pain; at other times, there is none; which may be owing to the manner, in which the tumour is affected by the edges of the bone, through which it passes. The pain is often made to go off by compression, but returns as soon as this is taken off. The tumour has an alternate motion, derived from the pulsation of the brain, or of the large arteries at its base. This throbbing motion has led many into error, by making them mistake the disease for an aneurism, as happened in the second case, related in the memoir of M. Louis. When the tumour is pushed sideways, and the finger

carried between it and the edge of the bone, through which the disease protrudes, the bony edge may be felt, touching the base of the swelling, and more or less constricting it. This symptom, when distinguishable, added to a certain hardness and elasticity, and sometimes a facility of reduction, forms a pathognomonic mark, which cannot deceive. By uniting all the preceding symptoms, and exercising, in the investigation, the spirit of combination, so necessary in these difficult cases, fungous tumours of the dura mater may be discriminated from hernia of the brain, external fleshy tumours, abscesses, exostoses, and other affections, which at first sight resemble them.

Generally speaking, fungous tumours of the dura mater are very dangerous, as well on account of their nature, as of the difficulty of curing them in any certain manner, and of the internal and external disorder, which they may occasion. Such as have a pedicle, the base of which is not extensive; which are firm in their texture, without much disease in the surrounding bone, are moveable, not very painful, and in persons, who are, in other respects quite well, are in general reputed to be the least perilous. These are the cases, in which a cure may be attempted, with a hope of success, though the event is always exceedingly doubtful.

When the contrary of what has been just related occurs, when the disease is of long continuance, and the brain already affected, nothing favourable can be expected.

Compression is the most simple means of cure, and that which has naturally occurred to such practitioners, as have mistaken the disease for an aneurism, or a hernia cerebri. The efficacy of this method has been further misconceived, because the tumour, when not very large, has sometimes been partly, or even wholly reduced, without any bad consequences. This had no little share in leading to errors, concerning the true character of the disease. But, as might be conceived, this reduction, only being attended with temporary success, and having no effect whatever on the original cause of the affection, the symptoms returned, and the tumour rose up again, the moment the compression was discontinued. There is a fact in the memoir by M. Louis, which seems to evince, that good effects may sometimes be produced by compression judiciously employed. A woman, brought to the brink of the grave by the symptoms, occasioned by a tumour of the above kind, having rested with her head, for some time, on the same side as the

tumour, found the swelling so suddenly reduced, without any ill effects, that she thought herself cured by some miracle. A compression artfully kept up, by means of a piece of tin, fastened to her cap, prevented the protrusion of the tumour again. The pressure, however, not having been always very exact, the symptoms every now and then recurred, while the tumour was in the act of being depressed again, and they afterwards ceased, on the swelling having assumed a suitable position. The symptoms were doubtless, occasioned by the irritation, which the tumour suffered, in passing the inequalities around the opening, through which it protruded. The patient lived in this state nine years, having every now and then trances, in one of which, attended with hiccough and vomiting, she perished.

As compression cannot be depended upon, the following safer method may be tried. It consists in exposing the tumour with a knife, which is certainly preferable to caustics, the action of which can never be limited, nor extended, exactly as one wishes. A crucial incision may be made through the scalp covering the tumour, and the flaps dissected up, and reflected, so as to bring all the bony circumference into view. Then with trephines repeatedly applied, or with what would be better, Mr. Hey's saws, all the margin of the bone should be carefully removed.

The tumour, thus disengaged on all sides, may be cut off with a scalpel. After this, some recommend applying to the cut surface an ointment containing the hydrarg. nitrat. rub. an application, which I would not recommend. On the contrary, it seems to me preferable, in order to avoid all occasion for the use of caustic, to remove every part of both layers of the dura mater immediately under the excrescence. By this means, all chance of the regeneration of the tumour will be prevented.

When the tumour is sarcomatous, and its pedicle small and narrow, as sometimes happens, one should not hesitate to cut it off.

This method is preferable to tying the base of such tumours with a ligature, as the latter plan cannot be executed, without dragging, and seriously injuring the dura mater, so as to excite dangerous consequences. The excision is also preferable to caustics, which cause great pain,

and very often convulsions. In performing the extirpation, we should remove the whole extent of the tumour, and, if possible, its root, even though it may extend as deeply as the internal layer of the dura mater. This step must not be delayed, for the disease will continue to increase, so as to affect the brain, become incurable, and even mortal. It is to such decision, that we must impute the success, which attended the treatment of the Spaniard Avalos, of whom Marcus Aurelius Severinus makes mention. The above nobleman was afflicted with intolerable head-achs, which no remedy could appease. It was proposed to him to trepan the cranium, an operation, to which he consented. This proceeding brought into view, under the bone, a fungous excrescence, the destruction of which proved a permanent cure of the violent pains, which the disease had occasioned. It is not mentioned in this case, whether the internal layer of the dura mater was healthy, or not; but, there is foundation for believing, that if the extirpation of these tumours be undertaken in time, and bold measures be pursued, as in the instance just cited, success would often be obtained. Indeed, reason would support this opinion; for, when the disease is not extensive, it is necessary to expose a much smaller surface of the dura mater.

M. Louis has described other tumours, which grow from the surface of the dura mater, after this membrane has been denuded, as after the application of the trephine. They only seem to differ from the preceding ones in not existing, before the opening was made in the skull. These cases are not to be confounded with the *hernia cerebri*. (*See this Article*) See on the preceding subject, *Mémoire sur les Tumeurs fongueuses de la Dure-Mère*, par M. Louis, in *Mém. de l'Académie de Chirurgie*, Tom. 5, 4to. or Tom. 13, 12mo. *Encyclopédie Méthodique, Partie Chirurgicale*, art. *Dure-Mère*. *Richerand's Nosographie Chirurgicale*, Tom. 2, p. 284. Edit. 2. *Lassus, Pathologie Chirurgicale*, Tom. 1, p. 497. Edit. 1809.

An account of the inflammation of the dura mater will be found in the article, *Head, Injuries of*.

DYSTÆCHIASIS. (from *δυσ*, bad, and *ταχος*, order.) An irregular arrangement of the eye-lashes.

DYSURIA, (from *δυσ*, difficulty, and *ουρον*, the urine.) A difficulty of discharging the urine.

E.

EAR, DISEASES OF.

AN organ, so valuable and necessary to the perfection of our existence, as the ear is, should have all the resources of surgery exerted for the preservation of its integrity, and the removal of the diseases, with which it may be affected. What, indeed, would have been our lot, if nature had been less liberal, and not endued us with the sense of hearing? As M. Leschevin has observed, we should then have been ill qualified for the receipt of instruction; a principal inlet of divine and human knowledge would have been closed; and there being no reciprocal communication of ideas, our feeble reason could never have approached perfection. Even our life itself being as it were dependent upon all such bodies as surround us, would have been incessantly exposed to dangers. The eyesight serves to render us conscious of objects, which present themselves before us, and, when we judge them to be hurtful, we endeavour to avoid them. But, to say nothing of our inability of looking on all sides at once, our eyes become of no service to us, whenever we happen to be enveloped in darkness. The hearing is then the only sense, that watches over our safety. It warns us, not only of every thing, which is moving about us, but likewise of noises, which are more or less distant. Such are the inestimable advantages which we derive from this organ. Its importance, when healthy, makes it worthy of the utmost efforts of surgery, when diseased. (See *M. Leschevin's Dissert. in Mémoires sur les Sujets proposés pour le Prix de l'Acad. Royale de Chirurgie, Tom. 9. p. 111, 112. Edit. 12mo.*)

1. Wounds of the External Ear.

The external ear, which is a sort of instrument calculated for concentrating the rays of sound, may be totally cut off, without deafness being the consequence. For a few days after the loss, the hearing is rather hard; but, the infirmity gradually diminishes, the increased sensibility of the auditory nerve compensates for the imperfections of the organic apparatus, and the acuteness of the sense is entirely restored. (*Richerand, Nosographie Chirurgicale, Tom. 2, p. 122. Edit. 2.*) However, if we are to credit the statement of

other writers, the recovery is far less complete, than M. Richerand represents it to be. Thus Leschevin notices, that they, who have lost the external ear, or have it naturally too flat, or ill shaped, have the hearing less subtle. The defect can only be remedied by an artificial ear, or an ear-trumpet, which receiving a large quantity of the sonorous rays, are directing them towards the meatus auditorius, thus does the office of the external part of the ear. (*Prix de l'Acad. Royale de Chirurgie, Tom. 9, p. 120. Edit. 12mo.*)

Wounds are not the only causes, by which the external ear may be lost: its separation is sometimes the consequence of ulceration, and sometimes the effect of the bites of horses and other animals. In some countries, it is a part, that is frequently attacked with inflammation and sloughing, in consequence of having been frozen. Except the external ear be totally separated from the head, the surgeon should not despair of being able to accomplish the reunion of it. This attempt should always be made, however small a connexion the detached part may have with the skin; for, in wounds of this kind, the efforts of surgery have occasionally succeeded beyond all expectation.

Wounds of the external ear, whatever may be their size and shape, do not require a different treatment from that of the generality of other wounds. The reunion of the divided part is the only indication, and it may be in most instances easily fulfilled by means of methodical dressings. Such writers, as have recommended sutures for wounds of the ear, (says Leschevin,) have founded this advice upon the difficulty of applying to the part a bandage, that will keep the edges of the wound exactly together. The cranium, however, affords a firm and equal surface, against which the external ear may be conveniently fixed. Certainly, it is not more easy to secure dressings on the nose than the ear; and, yet, cases are recorded, in which the cartilaginous part of the nose was wounded, and almost entirely separated, and the union was effected without the aid of sutures. (See *Mém. de M. Pibrac sur l'Abus des Sutures, in Mém. de l'Acad. de Chir. Tom. 3.*)

In wounds of the ear, then, we may conclude, that sutures are generally useless and unnecessary. As examples may occur, however, in which the wound may

be so irregular and considerable as not to admit of being accurately united, except by this means, it should not be absolutely rejected. An enlightened surgeon will not abandon altogether any curative plans; he only points out their proper utility, and keeps them within the right limits. When sticking plaster, simple dressings, and a bandage, that makes moderate pressure, appear insufficient for keeping the edges of a wound of the ear in due contact, the judicious practitioner will not hesitate to employ sutures.

When a bandage is applied to the external ear, it should only be put on with moderate tightness, since much pressure gives considerable uneasiness, and may induce sloughing of the part. In order to prevent these disagreeable effects, M. Leschevin advises us to fill the space behind the ear with soft wool or cotton, against which the part may be compressed without risk. (*Op. cit. p. 119.*)

In the application of sutures, the ancients have cautioned us to avoid carefully the cartilage, and to sew separately, one after the other, the skin of both sides of the ear. They were fearful, that pricking the cartilage would make it mortify, "*ce qui est souvent-fois arrivé,*" says Paré. But, notwithstanding so respectable an authority, as M. Leschevin has remarked, the moderns make no scruple about sewing cartilages. In wounds of the nose, Verdue expressly directs the skin and cartilage to be pierced at once in applying sutures, and the success of the plan is put out of all doubt by a multitude of facts. The same treatment may also be safely extended to the ear.

Celsus, lib. 8, c. 6, has mentioned fractures of the cartilage of the ear; but, such an accident seems hardly possible, unless the part be previously ossified. Hence, M. Leschevin could never meet with such a case, either in practice, or in the works of surgical writers.

2. Of the Meatus Auditorius, and its Imperfections.

This is the passage, which leads from the cavity of the external ear, called the concha, down to the membrane of the tympanum. This tube, which is partly cartilaginous, and partly bony, has an oblique winding direction, so that its whole extent cannot be easily seen. There are circumstances, however, in which it is proper to look as far as possible into the passage. Such is the case, when the surgeon is to extract any foreign body, to remove any excrescence, or to detect any other occasion of deafness. Fabricius Hil-danus gives a piece of advice upon this

subject, not to be despised; namely, to expose the ear to the rays of the sun, in order to be enabled to see the very bottom of the meatus auditorius externus.

The surgical operations, practised on the meatus auditorius, are confined to opening it, when preternaturally closed, extracting foreign bodies, washing the passage out with injections, and removing excrescences, which may form there.

The case, which we shall next treat of, is the imperforation of the meatus auditorius externus, a defect with which some children are born. When the malformation exists in both ears, it generally renders the subject dumb as well as deaf, for, as he is incapable of imitating sounds, which he does not hear, he cannot of course learn to speak, although the organs of speech may be perfect, and in every respect rightly disposed. In this case, the surgeon has to rectify the error of nature, and, (to use the language of M. Leschevin,) he has to give by a double miracle, hearing and speech to an animated being, who, deprived of these two faculties, can scarcely be regarded in society as one of the human race. How highly must such an operation raise the utility and excellence of surgery in the estimation of the world!

About twelve years ago, I remember a child being shewn to several medical gentlemen in London, as a curiosity; it was entirely destitute of all appearance of external ears, and no vestiges of the meatus auditorii could be seen. The natural situations of these openings were completely covered with the common integuments. Yet, it deserves attention, that the child could hear a great deal, though the sense was certainly dull and imperfect. I remember, that the circumstance of the patient hearing so well as he did, was what excited considerable surprise. I am sorry I do not more particularly recollect, at the present time, the degree, in which this sense was enjoyed, and several other circumstances, such as the child's age, power of speech, &c. The example, however, is interesting, inasmuch as it proves, contrary to the assertions of authors, that even an imperforate condition of both ears may be unattended with complete deafness, provided the internal and more essential parts of these organs are sound and perfectly formed.

When the meatus auditorius externus is merely closed by an external membrane, the nature of the case is evident, and the mode of relief equally easy. But, when the membrane is more deeply situated in the passage, near the tympanum, the diagnosis is attended with more dif-

ficulty, and the treatment with greater trouble.

If the preternatural membrane is external, or only a little way within the passage, it is to be divided with a bistoury; the small flaps are to be cut away; a tent, of a suitable size, is to be introduced into the opening; and the wound is to be healed *secundum artem*, care being taken to keep it constantly dilated, until the cicatrization is completed.

When the obstruction is deeply situated, we must first be sure of its existence, which is never ascertained, or even suspected, till after a long while. It is not till after children are past the age, at which they usually begin to talk, that any defect is suspected in the organ of hearing, because until this period, little notice is taken, whether they hear or not. As soon as it is clear, that this sense is deficient, the ears should always be examined with great attention, in order to discover, if possible, the cause of the deafness. Sometimes, the infirmity depends upon a malformation of the internal ear, and the cause does not then admit of detection. The most convenient method of making the examination is to expose the ear, which is about to be examined, to the light of the sun. In this situation, the surgeon will be able to see beyond the middle of the bony part of the meatus, if he places his eye opposite the orifice of the passage, and takes care to efface the curvature of the cartilaginous portion of the canal, by drawing upward the external ear. If the passage has been carefully cleansed, before the examination, the skin, forming the obstruction may now be seen, unless it be immediately adherent to the tympanum.

When the preternatural septum is not closely united to the tympanum, its destruction should be attempted, and hopes of effecting the object, either suddenly, or gradually, may reasonably be entertained. According to M. Leschevin, the particular situation of the obstruction is the circumstance, by which the surgeon ought to be guided in making a choice of the means for this operation. If the membranous partition is so far from the tympanum, that it can be pierced without danger of wounding the latter part, there can be no hesitation in choosing the plan to be adopted. In the contrary state of things, M. Leschevin is an advocate for the employment of caustic, not only on account of the risk of injuring the tympanum with a cutting instrument, but, also, because, if the puncture were ever so well executed, a tent could not be introduced into it, so as to prevent it from closing again.

In the first case, a very narrow sharp-

pointed bistoury should be used: after its blade has been wrapped round with a bit of tape to within a line of the point, it is to be passed perpendicularly down to the preternatural membrane, which is to be cut through its whole diameter. The instrument being then directed first towards one side, then the other, the crucial incision is to be completed. As the flaps, which are small and deeply situated, cannot be removed, the surgeon must be content with keeping them separated by means of a blunt tent. The wound will heal just as favourably as that occasioned in removing the imperforation of the concha, or outer part of the meatus auditorius. (*Prix. de l'Acad. de Chir. p. 124—126, Tom. 9.*) In the second case, that is to say, when the risk of wounding the tympanum leads us to prefer the employment of caustic, the safest and most commodious way of putting the plan in execution would be that of touching the obstruction, as often as circumstances may require, with the extremity of a bougie armed with the argenteum nitratum. In the intervals of the application, no dressings need be introduced, except a bit of clean soft cotton, for the purpose of absorbing any discharge, which may take place within the passage.

It is manifest, that if the whole, or a considerable part of the meatus auditorius externus were wanting, the foregoing measures would be insufficient. The following observations of M. Leschevin seem to merit attention: "I do not here allude to cases, in which a malformation of the bone exists. I know not, whether there are any examples of such an imperforation; but, it is clear, that it would be absolutely incurable. I speak of a temporal bone perfectly formed in all its parts, and the meatus auditorius of which, instead of being merely lined by a membrane, as in the natural state, is blocked up by the cohesion of the parietes of this membrane throughout a certain extent of the canal; just as the urethra, rectum, or vagina, is sometimes observed to be not simply closed by a membrane, but by a true obliteration of its cavity.

"Such a defect in the ear may be congenital, and it may also arise from a wound, or ulceration, of the whole circumference of the meatus auditorius externus, this canal having become closed by the adhesion of its parietes, on cicatrization taking place.

"Such an imperforation, whether congenital, or accidental, must certainly be more difficult to cure, than the examples treated of above; but, (says M. Leschevin) I do not for this reason believe, that the case ought to be entirely abandoned.

Yet, I would not have the cure attempted in all sorts of circumstances. For instance, if the defect only existed in one ear, and the other were sound, I would not undertake the operation, because, as the patient can hear tolerably well on one side, the advantages which he might derive from having the enjoyment of the other ear, would not be adequate to counterbalance the pain and bad symptoms occasioned by such an experiment, the success of which is extremely uncertain. I would not then run the risk of making a perforation, except in a case of complete deafness; and I propose this means only as a dubious one upon the fundamental maxim, so often laid down, that it is preferable to employ a doubtful remedy, than none at all.

"With respect to the mode of executing this operation," says M. Leschevin, "the trocar seems the most eligible instrument. I would employ one, that is very short, and the point of which is bluntish, and only projects out of a cannula as little as possible. This construction would indeed make the instrument less adapted to pierce any thing; but, still, as the parts to be perforated are firm, their division might be accomplished sufficiently well; and the inconvenience of a trivial difficulty in the introduction of the trocar is comparatively much less, than that, which would attend the danger of wounding with a sharper point the membrane of the tympanum. I would plunge the point of the instrument into the place, where the opening of the meatus auditorius externally ought naturally to be, and which would be denoted, either by a slight depression, or at all events, by attending to the different parts of the ear, especially, the tragus, which is situated directly over this passage. I would push in the trocar gently, in the direction of the canal formed in the bone, until the point of the instrument felt as if it had reached a vacant space. Then, withdrawing the trocar, and leaving the cannula, I would try, whether the patient could hear. I would then introduce into the cavity of the cannula itself a small, rather firm tent, of the length of the passage, or rather a small bougie. By means of a probe, I would push it to the end of the cannula, which I would now take out, observing to press upon the tent, which is to be left in. The rest of the treatment consists in keeping the canal pervious, making it suppurate, and healing it with common applications. One essential caution, however, would be that of keeping the part dilated long after it had healed: otherwise, it might close again, and a re-

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petition of the operation become necessary. This happened to Heister, as he himself apprises us, and it occurred to Roonhuysen in treating imperforations of the vagina.

"If the cohesion of the parietes of the meatus auditorius externus were to extend to the tympanum inclusively, the operation would be fruitless; but, as it is impossible to ascertain this circumstance, before the attempt is made, the surgeon would incur no disgrace, by relinquishing the operation, and giving up the treatment of an incurable disease. If, then, after the trocar were introduced to about the depth of the tympanum, the situation of which must be judged of by our anatomical knowledge, no cavity were met with, the operation should be abandoned; and, if in these circumstances, any one were to impute the want of success to the inefficacy of surgery, or the unskilfulness of the surgeon, he would act very unfairly.

"It is also plain, that such an operation could only cure a congenital deafness, inasmuch as the infirmity might depend solely upon the imperforation; for, if there should exist, at the same time, in the internal ear, any malformation, which might destroy the power of the organ, the remedying of the external defect would be quite useless." (*Leschevin, in Prix de l'Acad. de Chirurgie, Tom. 9, p. 127—132.*)

We find, that this author entertains a great dread of wounding the tympanum, and, certainly he is right in generally insisting upon the prudence of avoiding such an accident. It will appear, however, in the sequel of this article, that puncturing the tympanum has, under certain circumstances, been successfully practised, as a mode of remedying deafness: so far is it from being particularly dangerous, or destructive of the functions of the ear.

3. Unusual smallness of the Meatus Auditorius Externus.

Imperforation is not the only affection of the meatus auditorius, with which nature sometimes afflicts us, before our birth. This passage is occasionally too narrow, and, hence, there is not room enough, for the entrance of a due quantity of the sonorous rays, and the sense is of course unavoidably feeble. Leschevin mentions, that M. de la Metrie had seen this canal so narrow in a young person, that it could hardly admit a probe. What has been observed concerning the imperforation is also applicable to this case. If it depends upon malformation of the

bone, it is manifestly incurable; but, if it is owing to a thickening of the soft parts, within the meatus, hopes may be indulged of doing good by gradually dilating the passage by tents, which should be increased in size from time to time, and, lastly, making the patient wear for a considerable time, a tube, adapted to the part in shape. (*Leschevin, in Prix de l'Acad. de Chirurgie, Tom. 9, p. 132.*)

4. Faulty shape of the *Meatus Auditorius Externus*.

Anatomy informs us, that this passage is naturally oblique, and somewhat winding; and natural philosophy teaches us the necessity of such obliquity, in demonstrating, that it multiplies the reflections of the sonorous rays, and thereby strengthens the sense. This theory, says M. Leschevin, is confirmed by experience; for, there are persons, in whom the meatus auditorius is almost straight, and they are found to be hard of hearing. If there is any means of correcting this defect, it must be that of substituting, for the natural curvature of the passage, a curved and conical tube, which must be placed at the outside of the organ, just like a hearing trumpet. The acoustic instrument, invented by Deckers, which is much more convenient, might also prove useful.—(*Op. cit. p. 133.*)

5. *Extraneous Substances, Insects, &c. in the Meatus Auditorius Externus.*

Foreign bodies met with in this situation are inert substances, which have been introduced by some external force; insects, which have insinuated themselves into the passage; or the cerumen itself, hardened in such a degree, as to obstruct the transmission of the sonorous undulations. Worms, which make their appearance in the meatus auditorius, are always produced subsequently to some ulcerations in the passage, or in the interior of the tympanum, and, very often, such insects are quite unsuspected causes of particular symptoms. In the cases of surgery, published in 1778 at Stockholm, by Olaus Acrel, there is an instance confirming the statement just offered. It is the case of a woman, who having been long afflicted with a hardness of hearing, was suddenly seized with very violent convulsions, without any apparent cause, and soon afterwards complained of an acute pain in the ear. This affection was followed by a recurrence of convulsions, which were more vehement, than before. A small tent of fine linen, moistened with

a mixture of oil and laudanum, was introduced into the meatus auditorius, and, on removing it the next day, several small round worms were observed upon it, and, from that period, all the symptoms disappeared. To this case, we shall add another from Morgagni. A young woman consulted Valsalva, and told him, that when she was a girl, a worm had been discharged from her left ear; that another one, about six months ago, had also been discharged, very much like a small silk-worm in shape. This event took place after some very acute pain in the same ear, the forehead, and temples. She added, that since this, she had been tormented with the same pains, at different intervals, and, so severely, that she often swooned away for two hours together. On recovering from this state, a small worm was discharged, of the same shape as, but much smaller than, the preceding one, and that she was now afflicted with deafness and insensibility on the same side. After hearing this relation, Valsalva no longer entertained any doubt of the membrane of the tympanum being ulcerated. He proposed the employment of an injection, in order to destroy the nest of worms, which he presumed to exist. For this purpose, distilled water of St. John's wort, in which mercury had been agitated, was used. Morgagni adds, that nothing appears to him more proper, in such cases, to prevent a recurrence of such worms, than to avoid going to sleep, particularly in autumn and summer, without taking care to stop up the affected ear. If this be not done, flies attracted by the suppuration, enter the meatus auditorius, and, while the patient is unconscious, deposit their eggs in the ear. Acrel, in speaking of worms, generated in the meatus auditorius, observes, that there is no better remedy for them, than the decoction of ledum palustre, injected into the ear, several times a day. However, as it is not always possible to procure this plant, we shall recommend in such cases, in preference to all other remedies, a slight infusion of tobacco in oil of almonds, a few drops of which are to be introduced into the ear, and to be retained there by means of a little bit of cotton. This application, which is not injurious to the lining of the passage, is fatal to insects, and, especially, to worms, as various experiments have convinced naturalists. This method may also succeed in cases, in which caterpillars, ants, and other insects, have insinuated themselves into the meatus auditorius; but, it is always better, first to endeavour to extract them. A piece of lint, smeared with honey, often suffices for this pur-

pose, and when they cannot be extracted by this simple means, they may be taken out with a very small pair of forceps, however little of them may be visible. The latter method serves also for the extraction of cherry-stones, peas, or other seeds, which have been introduced into the meatus auditorius. If such substances should make too much resistance, forceps with stronger blades for breaking the extraneous bodies must be employed, and then the fragments are to be extracted piecemeal. But, in these cases, it is always proper to inject into the ear some oil of almonds, before attempting to extract the extraneous bodies. The presence of these substances often occasions the most extraordinary symptoms, as we may see in the fourth observation of Fabricius Hildanus. Cent. 13.

After four surgeons, who had been successively consulted, had in vain exerted all their industry to extract a bit of glass from the left ear of a young girl, the patient found herself abandoned to the most excruciating pain, which soon extended to all the side of the head, and which, after a considerable time, was followed by a paralysis of the left side, a dry cough, suppression of the menses, epileptic convulsions, and at length an atrophy of the left arm. Hildanus cured her by extracting the piece of glass, which had remained eight years in her ear, and had been the cause of all this disorder. Although the extraction must have been very difficult, it does not appear that Hildanus found it necessary to practise an incision behind the ear, as some authors have advised, and amongst them, Duverney, who has quoted the foregoing case. We must agree with Leschevin, that such an incision does not seem likely to facilitate the object very materially; for, it must be on the outside of the extraneous substance, which is the bony part of the canal. It is true, indeed, that the incision enables us, in some measure, to avoid the obliquity of the passage, as Duverney has observed; but, it is not such obliquity of the cartilaginous portion of the canal, that can be a great impediment; for, as it is flexible, it may easily be made straight, by drawing upward the external ear. Hence, Fabricius ab Aquapendente rejected this operation, which was first proposed by Paulus Ægineta; and it is justly disapproved of by Leschevin. (*Prix de l' Acad. de Chir. Tom. 9, p. 147, edit, 12mo.*)

6. *Meatus Auditorius obstructed with thickened, or hardened Cerumen.*

The cerumen, which is secreted into

the meatus auditorius by the sebaceous glands of the part, frequently accumulates there in very large quantities, and becoming harder and harder, at length acquires so great a degree of solidity, as entirely to deprive the patient of the power of hearing. Galen has remarked; *è numero eorum quæ meatum obstruunt, sor-des esse quæ in auribus colligi solent.* This species of deafness is one of those kinds, which are the most easy of cure, as is confirmed by observers, especially Duverney. Frequent injections, either with simple olive oil, or oil of almonds, have always been recommended in such cases. The injection is to be retained by a piece of cotton, and, when there is reason to believe that the matter is sufficiently softened, an attempt may be made to extract it by means of a small scoop-like instrument. Whatever success this plan may have obtained, various experiments were made at Chester, in 1769, by Haygarth, from which it appears, that warm water is still preferable. This dissolves the mucous matter, which connects together the truly ceruminous particles, and which is the cause of their tenacity; other applications only succeeding by reason of the water which they contain.

"The symptoms (says Mr. Saunders) which are attached to the inspissation of the cerumen are pretty well known. The patient, besides his inability to hear, complains of noises, particularly a 'clash' or confused sound in mastication, and of heavy sounds, like the ponderous strokes of a hammer.

"The practitioner is led by the relation of such symptoms to suspect the existence of wax; but he may reduce it to a certainty by examination.

"Any means capable of removing the inspissated wax may be adopted; but syringing the meatus with warm water is the most speedy and effectual, and the only means necessary. As the organ is sound, the patient is instantaneously restored." (*Anatomy of the human Ear, with a Treatise on its Diseases, by J. C. Saunders, 1806. p. 27, 28.*)

7. *Discharges from the Meatus Auditorius.*

Purulent discharges from the ear, either come from the meatus auditorius externus itself, or they originate from suppuration in the tympanum, in consequence of blows on the head, abscesses after malignant fevers, the small-pox, or the venereal disease. In such cases, the little bones of the ear are detached, and escape externally, and complete deafness is most frequently the consequence.

However, in a few instances, total deafness does not always follow even this kind of mischief, as I myself have witnessed in one or two instances. There is greater hope, when the disorder is confined to the meatus; as judicious treatment may now avert the most serious consequences. In Acrel's surgical cases, there is a case, relative to the circumstance, of which we are speaking. Suppuration took place in the meatus auditorius externus, in consequence of acute rheumatism, which was followed by vertigo, restlessness, and a violent head-ach. The matter discharged was yellowish, of an aqueous consistence, and acid smell. The meatus auditorius was filled with a spongy flesh. On introducing a probe, our author felt a piece of loose rough bone, which he immediately took hold of with a pair of forceps, and extracted. From the time, when this was accomplished, the discharge diminished; with the aid of proper treatment, the patient became perfectly well.

The meatus auditorius, like all other parts of the body, is subject to inflammation. This is frequently produced by exposure to cold. It is hardly necessary to say, that topical bleeding and antiphlogistic means in general are indicated. The meatus auditorius should also be protected from the cold air, particularly in the winter season, by means of a piece of cotton.

Mr. Saunders observes, "When the means employed to reduce the inflammation have not succeeded, and matter has formed, it is generally evacuated, as far as I have observed, between the auricle and mastoid process, or into the meatus. If it has been evacuated into the meatus, the opening is most commonly small, and the spongy granulations, squeezed through a small aperture, assume the appearance of a polypus. Sometimes the small aperture, by which the matter is evacuated, is in this manner even closed, and the patient suffers the inconvenience of frequent returns of pain from the retention of the discharge. When the parts have fallen into this state, it will be expedient to hasten the cure by making an incision into the sinus, between the auricle and mastoid process.

"It occasionally happens, that the bone itself dies, in consequence of the sinus being neglected, or the original extent of the suppuration. The exfoliating parts are the meatus externus of the os temporis or the external lamina of the mastoid process." (Page 24, 25)

8. Excrescences in the Meatus Auditorius.

Though the membrane, lining the

meatus auditorius, is very delicate, it is not the less liable to become thickened, and to form polypous excrescences. This case, however, is not common. As such tumours are ordinarily firmer in their texture, than polypi of the nose, they are sometimes not so easily extracted with forceps. When they are situated near the external orifice, and admit of being taken hold of with a small pair of forceps, or a hook, they may easily be cut away, when drawn outward, and this without any reason for fearing hemorrhage. This, indeed, is usually very trivial. When the tumours are more deeply situated, Mr. B. Bell recommends giving the preference to the use of a ligature. Here the same plan may be pursued as will be explained in the article *Polypus*. But it sometimes happens, that the excrescences cannot be removed in this manner; as, instead of being adherent by a narrow neck, they have a broad base, which occupies a considerable extent of the passage. In such cases, some have been so absurd as to advise the use of escharotics; but, as these applications cannot be used without risk of injuring the membrane of the tympanum, it is better to have recourse to some other method. (*Encyclopédie Méthodique; Partie Chirurgicale. Art. Auditif conduit.*) Mr. B. Bell recommends dilating the passage with bougies; but it is obvious that the pressure of such instruments would also be very likely to irritate and inflame the membrane of the tympanum.

9. Herpes of the Meatus Auditorius.

An herpetic ulcerous eruption sometimes affects the meatus auditorius and auricle, producing considerable thickening of the skin, and so great an obstruction of the passage, that a good deal of deafness is the consequence. Mr. Saunders remarks, that, in this case, "the ichor, which exudes from the pores of the ulcerated surface, inspissates in the meatus, and not only obstructs the entrance of sound, but is accompanied with a great degree of fœtor. This disease is not unfrequent. I have never seen it resist the effect of alterative medicines," the use of injections containing the hydrargyri muriatus, and the application of the unguentum hydrargyri nitrati. Mr. Saunders exhibited calomel as the alterative, and, in one instance, employed a solution of the argentum nitratum, as an injection. (Page 25, 26.)

10. Affections of the Tympanum.

This is sometimes effected with a pu-

reform ichorous discharge, attended with a loss of hearing, proportionate to the degree of disorganization which this part of the ear has sustained. In general, on blowing the nose, air is expelled at the meatus auditorius externus; and, when this is the case, it is evident, that the discharge is connected with an injury, or destruction of the membrana tympani. However, when the Eustachian tube is obstructed with mucus, or matter, or when it is rendered impervious, and permanently closed by inflammation, the membrana tympani may not be perfect, and, yet, it is clear, no air can in this state be forced out of the external ear in the above manner. An examination with a blunt probe, or with the eye, while the rays of the sun fall into the passage, should therefore not be omitted. If the membrane have any aperture in it, the probe will pass into the cavity of the tympanum, and the surgeon feel that his instrument is in contact with the ossicula.

In this manner the affection may be discriminated from an herpetic ulceration of the meatus auditorius externus. The causes are various: In scarlatina maligna, the membrana tympani occasionally inflames, and sloughs; all the ossicula are discharged, and if the patient live, he continues quite deaf. An ear-ach, in other words, acute inflammation of the tympanum, is the most common occasion of suppuration in this cavity, in which, and the cells of the mastoid process, a good deal of pus collects. At length, the membrana tympani ulcerates, and a large quantity of matter is discharged; but, as the secretion of pus still goes on, the discharge continues to ooze out of the external ear.

Instead of stimulating applications, inflammation of the tympanum demands the rigorous employment of antiphlogistic means. Unfortunately, it is a too common practice, in this case, to have recourse to acrid spirituous remedies. Above all things the repeated application of leeches to the skin behind the external ear, and over the mastoid process, should never be neglected. As soon as the inflammation ceases, the degree of deafness, occasioned by it, will also disappear. This, however, does not always happen.

When an abscess is situated in the cavity of the tympanum, Mr. Saunders seems to think, that the membrana tympani should not be allowed to burst by ulceration, but be opened by a small puncture. (Page 31.)

Sometimes the disease, of which we are treating, is more insidious in its at-

tack; slight paroxysms of pain occur, and are relieved by slight discharges. The case goes on in this way, until, at last, a continual discharge of matter from the ear takes place. The disorder is destructive in its tendency to the faculty of hearing, and it rarely stops, until it has so much disorganized the tympanum and its contents, as to occasion total deafness. Hence, Mr. Saunders very properly defends the propriety of making attempts to arrest its progress,—attempts which are free from danger; and he censures the foolish fear of interfering with the complaint, founded on the apprehension, that bad constitutional effects may originate from stopping the discharge.

If the case be neglected, the tympanum is very likely to become carious; before which change, the disease, says Mr. Saunders, is most commonly curable.

Mr. Saunders divides the complaint into three stages; 1. A simple puriform discharge. 2. A puriform discharge complicated with funguses and polypi. 3. A puriform discharge with caries of the tympanum. As the disease is a local one, direct applications to the parts affected are chiefly entitled to confidence. Blisters and setons may be advantageously employed in aid of topical applications. Mr. Saunders' practice, in these cases, consists in administering laxative medicines and fomenting the ear, while inflammatory symptoms last, and afterwards injecting a solution of zincum vitriolatum, or cerussa acetata.

In the second stage, when there are funguses, he removes or destroys them with forceps, afterwards touches their roots with the argentum nitratum, or injects a solution of alum, zincum vitriolatum, or argentum nitratum.

11. *Obstructions of the Eustachian Tube.*

This is often a cause of a considerable degree of deafness, because it is necessary for perfect hearing, that air should be conveyed from the mouth through this passage into the cavity of the tympanum, which now can no longer happen.

A degree of deafness generally attends a severe cold, which is accounted for by the Eustachian tube being obstructed with thickened mucus. Mr. Saunders tells us, that the obstruction most frequently arises from syphilitic ulcers in the throat, or sloughing in the cynanche maligna. The deafness comes on when such sores are healed, that is, when the obstruction is complete. The descent of a nasal polypus into the pharynx, and enlarged tonsils have also been known to close the tube. (Page 42.)

When the Eustachian tube is obstructed, the patient cannot feel the membrana tympani crackle, as it were, in his ear, on blowing forcibly with his nose and mouth stopped. Previous ulceration, or disease, of the throat, will sometimes aid in facilitating the diagnosis.

When the Eustachian tube is obstructed with mucus, it has been proposed to employ injections, which are to be thrown by means of a syringe and catheter, into the guttural orifice of that canal. This operation, however, is alleged to be always attended with trouble, and, when the os spongiosum inferius happens to be situated near the floor of the orbit, the introduction of any instrument like a female catheter, would be impracticable. (*Richerand Nosographie Chirurgicale, Tom. 2, p. 131, edit. 2.*)

Mr. A. Cooper had noticed, that hearing was only impaired, not lost, when suppurations in the tympanum, had injured, and even destroyed the membrana tympani, and that the degree of deafness by no means equalled what resulted from an obstruction of the Eustachian tube. Hence, when the tube was permanently obliterated, he conceived, that a small puncture of the membrana tympani might be the means of enabling the patient to hear. Mr. A. Cooper practised the plan with success, and others have imitated him with the same result.

The operation consists in introducing an instrument, resembling a hydrocele trocar, but curved, into the meatus auditorius externus, and pushing it through the anterior and inferior part of the membrana tympani; a place rendered most eligible on account of the situation of the chorda tympani and manubrium of the malleus, parts, which should be left uninjured. The instrument must not be introduced far, lest it should wound the vascular lining of the tympanum, and cause a temporary continuance of the deafness, by an effusion of blood. When the puncture is made, in proper cases, and in a judicious manner, hearing is immediately restored. A small hole in the membrana tympani now conveys the air into the cavity of the tympanum, answering the same purpose as the Eustachian tube.

The surgeon will be able to operate with more ease, if he take care to lessen the curvature of the meatus auditorius by drawing upward the external ear.

There is some chance of a relapse in consequence of the opening closing up. This consideration has led Richerand to propose making the aperture with a caustic, so as to destroy a part of the membrane. (*Nosographie Chirurgicale, Tom. 2.*

p. 132, edit. 2.) The suggestion is not, however, likely to be adopted, on account of the inconveniences of applying caustic within the ear. Mr. Saunders is an advocate for making the opening large.—This gentleman relates, that he instantaneously restored hearing in one case, in which the patient had been deaf thirty years, in consequence of a loss of part of his palate by syphilis. (*Page 45.*) Mr. A. Cooper's cases are in the *Philosophical Transactions for 1802.*)

Puncturing the membrana tympani has been attended with some degree of success in France, as well as this country. It is not to be dissembled, however, that there are numerous failures. We are informed, that Professor Dubois has done the operation in four instances, without success. (*Richerand Nosographie Chirurgicale, Tom. 2, p. 132.*)

In most cases, the patients, who have been benefited, are said to have experienced pain just after the trocar was withdrawn. The organ, in consequence of not being accustomed to sound, had become so extremely sensible, that it could not bear the gentlest impression of the sonorous vibrations, and the patient's first request, after the perforation was made, was that they, who were near him, might speak softly. This excessive tenderness of the sense gradually subsides.

12. Diseases of the Labyrinth.

No doubt deafness (and that kind of it which frequently foils the most skilful men) arises from an insensible state of the portio mollis of the auditory nerve, or of the surfaces, on which its filaments are spread. This affection is analogous to the amaurosis, or gutta serena, in which, though every part of the eye may seem to possess its natural structure, sight is lost, because the rays of light only strike against a paralytic, or insensible retina. Mr. Saunders dissected the ears of two deaf patients, with the greatest care, but could not discover the least deviation from the natural structure. Mr. Cline, however, found the labyrinth of a person born deaf filled with a caseous substance, in lieu of the natural limpid fluid, found in this situation, and the supposed use of which is to transmit the vibration of sound.

Mr. Saunders remarks, that all the diseases of the internal ear may be denominated nervous deafness: the term, in this sense, embracing every disease, the seat of which is in the nerve, or parts containing the nerve. Nervous deafness is attended with various complaints in different cases, noises in the head of sundry

kinds, the murmuring of water, the hissing of a boiling kettle, rustling of leaves, blowing of wind, &c. Other patients speak of a beating noise, corresponding with the pulse, and increased by bodily exertion, in the same degree as the action of the heart. *Saunders, p. 47.*

According to this author, there is a syphilitic species of nervous deafness, attended with a sensation of some of the above peculiar noises; he relates a case, in which the hearing was completely restored, in five weeks, by a mercurial course.

Mr. Saunders has relieved several cases of nervous deafness by confining patients to low diet, giving them calomel freely, repeated doses of natron vitriolatum, or magnesia vitriolata, sometimes twice, sometimes thrice, a week, or according to circumstances, and applying blisters behind the ears at intervals of a week. This plan is to be persevered in.

Were I to offer an opinion on this subject, I should certainly say, that the analogy, between the deafness, arising from paralysis of the nerve, and amaurosis, is so great, that the very same treatment, which has been found efficacious in the latter cases, promises to be of most avail in the former. (See *Amaurosis*.) The reader may consult *Duverney sur l'Organe de l'Ouïe; Memoire sur la Théorie des Maladies de l'Oreille. et sur les moyens que la Chirurgie peut employer pour leur curation, in prix de l'Acad. de Chirurgie, Tom. 9, p. 111, &c. edit. 12mo. Richerand's Nosographie Chirurgicale, Tom. 2, p. 122, &c. Edit. 2.* A. Cooper, in the *Philosophical Transactions for 1802: Saunders on the Anatomy and Diseases of the Ear, 1806.*

ECBRAS'MATA. Painful, inflammatory pustules on the surface of the body.

ECBYRSO'MATA. Protuberances of the bones at the joints.

ECCHY'MATA. See *Ecbrasmata*.

ECCHYMO'MA. **ECCHYMOSIS.**—(from *εκχυναι*, to pour out.) This is a superficial, soft swelling, which makes the skin livid or blue, and is produced by blood extravasated in the cellular substance.

The causes of an ecchymosis are falls, blows, sprains, &c. which occasion a rupture of the small vessels on the surface of the body, and a consequent effusion of blood, even without an external breach of continuity. Ecchymosis is one of the symptoms of a contusion. (See *Contusion*.) A considerable ecchymosis may originate from a very slight bruise, when one of the ruptured vessels is capable of pouring out a large quantity of blood into the interstices of the cellular substance. Ecchymosis does not, in general, make

its appearance till several hours after the operation of its cause; at least, it is not till after this time that the black, blue, and livid colour of the skin is most conspicuous. A black eye, which is only an ecchymosis, is always most disfigured six or eight hours after its occurrence.

In the article *Bleeding*, we have noticed how an ecchymosis may arise from the blood getting out of the vein into the adjacent cellular substance.

Common cases of ecchymosis are generally easily cured, by applying discutient lotions, and administering one or two doses of any mild purgative salt. The best topical applications, are vinegar, the lotio salis ammoniaci, spirit, vin. camph. and aq. ammon. acet.

The object is to avert inflammation, and to promote the absorption of the extravasated fluid.

I have seen such success attend the practice of dispersing collections of extravasated blood, by means of absorption, that the plan of evacuating it by an incision, seems to me to be hardly ever proper in cases of ecchymosis. When an opening is made into such tumours, and air is admitted, the portion of blood which cannot be pressed out, soon putrefies, and extensive inflammation and suppuration, are the too frequent consequences.

ECCHYMO'MA ARTERIOSUM. The false aneurism. See *Aneurism*.

ECCLY'SIS. A dislocation.

ECCOPE. The cutting away of any part.

ECCOPE'US. The ancient raspatory used in trepanning.

EC'DORA. An excoriation of the urethra.

ECHINOPIITHIA'LMIA. (from *εχινος*, a hedge-hog, and *οφθαλμια*, an inflammation of the eye.) An inflammation of the eye lids, attended with a projection of the eyelashes, which stand out, like the quills of a hedge-hog.

ECPEPIES'MENOS. Ulcers with high protuberant edges. A depressed fracture of the skull.

ECPIESMA, ECPIESMOS. A morbid protrusion of the eye.

ECPLEROMA. Hippocrates applies this term to hard balls, or substances, which were put in the arm-pit, when a dislocated shoulder was about to be reduced by the heel.

ECPYE'MA. (from *εκ* and *πυον*, pus.) Suppuration; an abscess.

EC'PYSIS. An excrescence.

ECRE'XIS. A rupture, or laceration of the uterus.

ECROUELLES. The French name of the king's evil, or scrophula.

ECSARCO'MA. (from *ex* and *σαρξ*, *flesh*.) A fleshy excrescence.

ECTHIL'MMA, ECTHIL'PSIS. Ulceration caused by pressure on the skin.

ECTILLO'TICA. Medicines, which destroy corns, or tubercles, or which remove superfluous hair.

ECTOPOCYSTICA ISCHURIA. A retention of urine from a hernia of the bladder.

ECTRIMMA. An ulceration of the skin over the os sacrum, from lying long in one posture.

ECTROPIUM. (from *εκτρέπω*, *to divert*.) A turning out, or an eversion of the eyelids.

Just as excessive relaxation of the skin of the eyelids, and a morbid contraction of their lining, near their edges, in consequence of ulcerations and cicatrices, occasion a faulty inclination of the tarsus and eyelashes against the eye; so, sometimes, an elongation and swelling of the membranous lining of the eyelids, or too great a contraction and shortening of the skin of the eyelid itself, or neighbouring parts, produce an opposite disorder to *trichiasis*, viz. an eversion of the eyelids, termed *ectropium*.

Of course, in respect to causes, there are two species of this disease; one, produced by an unnatural swelling of the lining of the eyelids, which not only pushes their edges from the eye-ball, but also presses them so forcibly, that they become everted; the other, arising from a contraction of the skin covering the eyelid, or of that in the vicinity, by which means the edge of the eyelid is first removed for some distance from the eye, and afterwards turned completely outward, together with the whole of the affected eyelid.

The morbid swelling of the lining of the eyelids, which causes the first species of ectropium (putting out of present consideration a similar affection incidental to old age,) arises mostly from a congenital laxity of this membrane, afterwards increased by obstinate chronic ophthalmies, particularly of a scrophulous nature, in relaxed, unhealthy subjects; or else the disease originates from the small-pox affecting the eyes.

While the disease is confined to the lower eyelid, as it most commonly is, the lining of this part may be observed rising in the form of a semilunar fold, of a pale red colour, like the fungous granulations of wounds, and intervening between the eye and eyelid, which latter it in some measure everts. When the swelling is afterwards occasioned by the lining of both the eyelids, the disease assumes an annular shape, in the centre of which the eye-

ball seems sunk, while the circumference of the ring presses, and everts the edges of the two eyelids so as to cause both great uneasiness and deformity. In each of the above cases, on pressing the skin of the eyelids with the point of the finger, it becomes manifest, that they are very capable of being elongated, and would readily yield, so as entirely to cover the eye-ball, were they not prevented by the intervening swelling of their membranous lining.

Besides the very considerable deformity, which the disease produces, it occasions a continual discharge of tears over the cheek, and, what is worse, a dryness of the eye-ball, frequent exasperated attacks of chronic ophthalmy, incapacity to bear the light, and lastly, opacity and ulceration of the cornea.

The second species of ectropium, or that arising from a contraction of the integuments of the eyelids, or neighbouring parts, is not unfrequently a consequence of puckered scars, produced by the confluent small-pox; deep burns; or the excision of cancerous, or encysted tumours, without saving a sufficient quantity of skin; or, lastly, the disorder in the effect of malignant carbuncles, or any kind of wound attended with much loss of substance. Each of these causes is quite enough to bring on such a contraction of the skin of the eyelids, as to draw these parts towards the arches of the orbits, so as to remove them from the eye-ball, and turn their edges outward. No sooner has this circumstance happened, than it is often followed by another one equally unpleasant, namely, a swelling of the internal membrane of the affected eye-lids, which afterwards has a great share in completing the eversion. The lining of the eye-lids, though trivially everted, being continually exposed to the air, and irritation of extraneous substances, soon swells, and rises up, like a fungus. One side of this fungus-like tumour covers a part of the eye-ball; the other pushes the eye-lid so considerably outward, that its edge is not unfrequently in contact with the margin of the orbit. The complaints, induced by this second species of ectropium, are the same as those brought on by the first; it being noticed, however, that in both cases, whenever the disease is very inveterate, the fungous swelling of the inside of the eyelids, becomes hard, coriaceous, and, as it were, callous.

Although in both species of ectropium, the lining of the eye-lids seems equally swollen, yet the surgeon can easily distinguish to which of the two species the disease belongs. For, in the first, the skin of the eye-lids, and adjoining parts, is not deformed with scars, and by press-

ing the everted eyelid with the point of the finger, the part would with ease cover the eye, were it not for the intervening fungous swelling. But, in the second species of ectropium, besides the obvious cicatrix and contraction of the skin of the eyelids, or adjacent parts, when an effort is made to cover the eye with the everted eyelid, by pressing upon the latter part with the point of the finger, it does not give way, so as completely to cover the globe, or only yields, as it ought to do, for a certain extent; or it does not move in the least from its unnatural position, by reason of the integuments of the eyelids having been so extensively destroyed, that their margin has become adherent to the arch of the orbit.

From a comparison of the two species of ectropium, it clearly appears, that the cure of this disease cannot be accomplished with equal perfection in both its forms, and that the second species is even in some cases, absolutely incurable. For, as in the first species of ectropium, the disease only depends upon a morbid intumescence of the internal membrane of the eyelids, and the treatment merely consists in removing the redundant part, art possesses many efficacious means of accomplishing what is desired. But, in the second species of ectropium, the chief cause of which arises from the loss of a portion of the skin of the eyelids, or adjacent parts, which loss no known artifice can restore, surgery is not capable of effecting a perfect cure of the malady. The treatment is confined to remedying, as much as possible, such complaints as result from this kind of eversion, and this can be done in a more or less satisfactory manner, according as the loss of skin on the eyelid is little, or great. Cases, in which so much skin is deficient, that the edge of the eyelid is adherent to the margin of the orbit, are to be abandoned as incurable. *Si nimium palpebræ deest*, says Celsus, *nulla id restituere curatio potest*; (*lib. 7. cap. 7.*) Hence, in treating the second species of ectropium, the degree of success attending the cure, may always be estimated, by remarking to what point the eyelid admits of being replaced, on being gently pushed, with the end of the finger, towards the globe of the eye, both before and after the employment of such means as are calculated to effect an elongation of the skin of the eyelid; for, it is to this point, and no further, that art can reduce the everted part, and permanently keep it so replaced. With respect to the treatment of the first species of ectropium; when the disease is recent, the fungous swelling of the lining of the eyelid not considerable, and consequently, the edge of the eyelid not much

turned out, and in young subjects (for in old ones the eyelids are so flaccid, that the disease is irremediable) it may be cured by destroying the fungous surface of the internal membrane of the eyelid, with the *argentum nitratum*, which is to be done as follows:—The surgeon must evert the whole of the affected eyelid with his left hand, and with his right wipe it dry with a piece of rag. Then he is to rub the caustic forcibly over the whole surface of the fungous swelling, so as to form an eschar. And, that the patient may suffer as little as possible, an assistant is instantly to apply a little oil to the burnt part, immediately the caustic is removed, by which means the *argentum nitratum* will be kept from dissolving in the tears, and spreading over the eye. Should, however, any part of the caustic be dissolved, and give the patient pain, the surgeon, or attendants, must immediately wash the irritating substance away, by repeatedly bathing the eye with new milk. The cauterization is to be repeated for several days in succession, until the *argentum nitratum* has produced a sufficient destruction of the internal membrane of the eyelid, and of its fungous surface, particularly near the tarsus. Afterwards, bathing the eye with plain water, or barley-water, and *mel. rosæ*, will prove sufficient for healing the sore on the inside of the eyelid. The result of such treatment will be, that, in proportion as the wound within the eyelid heals, the eversion will gradually diminish, and the edge of the eyelid at last return to its natural position.

This plan of cure can only be successfully put in practice, in cases in which the ectropium is slight and recent. To remedy the considerable and inveterate form of the first species of the disease, in an expeditious and effectual way, the quickest and safest plan is to cut away the whole of the fungous swelling, closely to the muscular substance, on the inside of the eyelid.

The patient being therefore seated, with his head a little inclined backward, the surgeon, with the index and middle finger of his left hand, is firmly to keep the eyelid everted, and holding a small pair of curved scissors, with convex edges, in his right, he is completely to cut off the whole fungosity of the internal membrane of the eyelid, as near as possible to its base. The same operation is then to be repeated on the other eyelid, should that be affected with the same disorder. If the excrescence should be of such a shape, that it cannot be exactly included within the scissors, it must be raised as much as possible, with forceps, or a double-pointed hook, and dissected off at its base, by means of a small bistoury with a convex

edge. The bleeding, which seems, at the beginning of the operation, as if it would be copious, stops of itself, or as soon as the eye is bathed with cold water. The surgeon is then to apply the dressings, which are to consist of two small compresses, one put on the upper, the other on the lower arch of the orbit, and over these the uniting bandage, in the form of the monocolus, or so applied as to compress and replace the edges of the everted eyelids, in order, to make them cover the eye. On the first removal of the dressings, which should take place about twenty-four or thirty hours after the operation, the surgeon will find the whole, or almost the whole, of the eyelid, in its natural position. The treatment should afterwards consist in washing the ulcer on the inside of the eyelid with simple water, twice a day, or else with aqua malvæ, or barley-water, and mel. rosæ, until it is completely well. If, towards the end of the cure, the wound should assume a fungous appearance, or the edge of the eyelid seem to be too distant from the eyeball, the wound on the inside of the eyelid must be rubbed several times with the argemum nitratum, for the purpose of destroying a little more of the membranous lining, so that, when the cicatrization follows, a greater contraction of it may take place, and the edge of the eyelid be drawn still nearer the eye. However, proper steps must also be pursued, in order to resist the principal causes on which the ectropium depends, particularly, chronic ophthalmia, the relaxed and varicose state of the conjunctiva, &c. (See *Ophthalmia*.)

In the second species of ectropium, or that produced by an accidental contraction of the skin of the eyelids, or neighbouring parts, the curative indication does in no respect differ from what it is in the foregoing instance. If a contraction of the integuments has proved capable of everting the eyelid, the excision of a piece of the internal membrane of the part, and the cicatrix which will follow, must also be capable, for the same reason, of bringing back the eyelid into its natural position. But, since nothing can restore the lost skin, the shortened state of the whole eyelid, in whatever degree it exists, must always continue, even after any operation the most skilfully executed. Hence, the treatment of the second species of ectropium will never succeed so perfectly as that of the first, and the replaced eyelid will always remain shorter, than natural, in proportion to the quantity of integuments lost. It is true, that, in many cases, the eversion seems greater than it actually is, in regard to the small quantity of skin lost or destroyed; for, when the disease

has once begun, though the contraction of the skin may be trivial, in consequence of the little quantity of it deficient, still the swelling of the lining of the eyelid, which never fails to increase, at last brings on a complete eversion of the part. In these cases, the cure may be accomplished with such success, as is surprising to the inexperienced; for, after the fungous swelling of the internal membrane of the eyelid has been cut off, and the edge of the part approximated to the eyeball, the shortening of the eyelid, remaining after the operation, is so trivial, that it may be considered as nothing, in comparison with the deformity and inconvenience occasioned by the ectropium. Whenever, therefore, the retraction of the skin, of the everted eyelid, and the consequent shortness of it, are such, as not to prevent its rising again and covering the eye, if not entirely, at least moderately, the surgeon should cut away the internal membrane of the everted eyelid, as already explained, so as to produce a loss of substance on the inside of the everted eyelid. This may be done, as most convenient, either with the convex-edged curved scissors, or small convex-edged bistoury. In inveterate cases of ectropium, in which the tumid lining of the eyelids has become hard and callous, it is best to apply to the everted eyelid, for a few days before the operation, a soft bread and milk poultice, in order to render the part flexible, and more easily separated, than it could be in its former rigid state.

It is a most certain truth, that making a division of the cicatrices, which have given rise to the shortening and eversion of the eyelid, does not procure any permanent elongation of this part, and consequently it is of no avail in the cure of the present disease. We see the same circumstance occur after deep and extensive burns of the skin of the palm of the hand and fingers: whatever pains may have been taken, during the treatment to keep the hand and fingers extended, no sooner is the cicatrization thus completed, than the fingers become irremediably bent. The same thing happens after extensive burns of the skin of the face and neck. Fabricius ab Aquapendente, who well knew the inutilty of making a semilunar cut in the skin of the eye-lids, for the purpose of remedying their shortening and eversion, proposes, as the best expedient, to stretch them with adhesive plasters, applied to them and the eyebrow, and tied closely together. Whatever advantage may result from this practice, the same degree of benefit may be derived from using, for a few days, a bread and milk poultice,

afterwards oily embrocations, and, lastly, the uniting bandage, so put on as to stretch the shortened eyelid, in an opposite direction to that produced by the cicatrix. This practice should always be carefully tried, before restoring to the operation.

The patient being seated, if an adult, or placed on a table with his head a little elevated, and held by proper assistants, if a child, the surgeon, with a small convex-edged bistoury, is to make an incision of sufficient depth into the internal membrane of the eye-lid, along the tarsus, carefully avoiding the situation of the puncta lachrymalia. Then he should raise with a pair of forceps, the flap of the divided fungous membrane, and continue to detach it, with the bistoury, from the subjacent parts, all over the inner surface of the eye-lid, as far as where the membrane quits this part, to be reflected over the front of the eye, under the name of *conjunctiva*. The separation being thus far accomplished, the membrane is to be raised still more with the forceps, and cut off with one, or two strokes of the scissors, at the lowest part of the eye-lid. The compresses and bandage, to keep the eye-lid replaced, are to be applied, as above directed. On changing the dressings, a day, or two, after the operation, the eye-lid will be found, in a great measure, replaced, and the disfigurement, which it caused, greatly amended. The operation is rarely followed by bad symptoms, such as vomiting, violent pain, and inflammation. However, should they occur, the vomiting may be relieved by means of an opiate clyster, and, as for the pain and inflammation, attended with great tumefaction of the eye-lid operated upon, these complaints may be cured by applying a poultice, or bags filled with emollient herbs, at the same time employing internal antiphlogistics, until the inflammation and swelling have subsided, and suppuration has commenced on the inside of the eye-lid, on which the operation has been done. After this, the treatment is to consist in washing the part, twice a day, with barley-water and mcl. rosa, and, lastly, in touching the wound a few times with the *argutum nitratum*, in order to keep the granulations within certain limits, and to form a permanent cicatrix, proper for maintaining the eye-lid replaced. (*Scarpa sulle Malattie degli Occhi*.)

[The following observations are taken from Adams on Ectropium.]

Few diseases of the eye, or its appendages, exhibit a more deformed appearance, or prove more distressingly painful

to the patient, than Ectropium, or eversion of one or both of the eye-lids. The frequency of its occurrence, and the repeated attacks of acute inflammation of the eyeball, as well as of the lid, produced by the exposure of a large portion of the conjunctiva to the influence of irritating causes, have attracted the attention of many professional men of the first celebrity; and different modes of treatment have been recommended for its removal. Among others, Professor Scarpa proposes, in recent and slight cases of eversion, to destroy the conjunctiva, at the edge of the tarsus with caustic; and, when the disease is more considerable, to extirpate the whole fungus close to the external muscular substance of the eye-lid, with the curved scissors; but he adds, that, in advanced life, the eye-lids are so much relaxed, that the disease may be regarded as altogether incurable. My own experience is fully in unison with that of the learned Professor, respecting the description of cases in which caustic may be advantageously employed; but, on the contrary, when the eversion is considerable, and consequently the tarsus much elongated, I have never found the simple excision of the fungus sufficient to effect a radical cure. It doubtless lessens the deformity; but as a certain degree of eversion still remains after this operation, the vessels, from repeated inflammation, again become so turgid and overloaded with blood, as by their weight and distention to re-produce the disease in as great a degree as before. Mortified at having myself failed, like others, in the removal of this deformity, I endeavoured, soon after the establishment of the West-of-England Eye Infirmary at Exeter, to which I was appointed Surgeon, to devise some more effectual method of cure than any of those hitherto practised. With this view, I was led attentively to mark the appearance of the complaint in its most aggravated form, and to compare it with that of the eye-lids in a healthy state. The edges of the tarsi, if the upper and lower lids are free from disease, when the eye is closed, are very nearly parallel; but where the eversion exists in a considerable degree in the lower lid, its edge is forced down towards the cheek, and forms a line of a crescent like figure.

In consequence of this morbid change in the parts, so much of the exquisitely sensible membrane of the eye-lid becomes everted, as to prove a continual source of pain and irritation to the patient, when exposed to heat or cold, sharp winds, dust, &c. Intolerance to a strong light, accompanied with an almost continual flux of tears, which chiefly flow over the cheek, and excoriate the integuments of the eye-

lid and cheek, still further increase the sufferings of the patient. From repeated attacks of inflammation, which often give rise to opacities of the cornea, the conjunctiva at length becomes highly vascular, much thickened, and granulated in appearance: thus producing that disagreeable aspect which the complaint assumes under its worst form.

On first adopting the operation about to be described, I employed a very small curved bistoury, the point of which I carried along the inside of the eye-lid, at its outer angle, downwards and outwards, as far as the point of reflection of the conjunctiva would admit. I then pushed it through the whole substance of the everted eye-lid and its integuments, and cut upwards through the tarsus, making an incision nearly half an inch in length. With a curved pair of scissors I next nipped off a piece of the edge of the tarsus, about the third of an inch in width, and afterwards I removed, with the same instrument, the whole of the diseased conjunctiva, to prevent it from mechanically irritating the eye-ball. After the profuse hæmorrhage had ceased, I passed a needle and ligature through the whole substance of the two divided portions, and brought the raw surfaces as accurately into contact as possible. Finding, however, that too much integument had been left at the lower part of the incision, which formed a small knob after the wound had cicatrised, I substituted, in subsequent operations, in preference to the scalpel, a pair of straight scissors, with which I cut out an angular piece of the lid, resembling the letter V. This prevented the formation of the little protuberance, but the incision did not heal at its upper part by the first intention. It was, however, essential that this process should, if possible, be accomplished, since, independent of the delay that was thus produced in effecting the cure, the space between the two disunited edges of the lid became filled up by granulations, which in some measure conduced to the reproduction of the disease. As the frequent motion of the eye-lids, however, seemed to oppose the greatest obstacle to the adhesive process, by preventing the divided surfaces being accurately retained in contact, I left about a quarter of an inch of the lid adjoining its external angle; and, after shortening it as much as was necessary, brought the two edges into juxta-position, in which situation it was retained by means of a suture, which completely answered my expectations. I have not specified the length of that portion of the lid necessary to be removed, since this depends on the degree of elongation and consequent eversion, and must therefore in a great measure be left

to the judgment of the operator. It may not, however, be here improper to caution the surgeon against too much shortening of the parts, as, in this case, they could not be brought into contact without stretching them to such a degree as to produce ulceration, thereby detaching the ligature before an union is effected. On the other hand, if too small a portion of the diseased parts be removed, so that the least eversion in the centre of the lid be suffered to remain, chronic inflammation will be likely to ensue, and the vessels becoming turgid will, by their weight and distention, again produce a morbid elongation of the tarsus, that must finally terminate in a recurrence of the disease. By an attention to these circumstances, none of the patients on whom I have operated, for this malady, have ever been subjected to a relapse. It has often surprised me, that this simple operation, which has proved uniformly successful with me, should not have occurred to Professor Scarpa, or, so far as I have been able to discover, to any other of those ingenious practitioners who have professedly written on the subject.

Purulent ophthalmia, whether occurring in children or adults, is often productive of eversion of the eye-lids. This variety of the disease, however, I dare venture to assert, may always be relieved by freely unloading the vessels by scarifications on the inner edge of the eye-lid, after the acute symptoms of inflammation have subsided. But should this highly important practice be too long deferred, the parts concerned in the production of the disease lose their tone, and become gradually more everted in proportion to the length of time it exists, and the frequency of the attacks of inflammation, till the conjunctiva is completely exposed. Hitherto my experience of its efficacy has however been confined to those cases of eversion arising from neglected lippitudo, or acute attacks of inflammation of the conjunctiva, which had been either wholly unattended to, or improperly treated. But the disease sometimes exists in a more complicated state, when it is caused by small-pox, burns, or scalds of the face, &c. In such instances, very firm adhesions are formed between the integuments of the eye-lid and those of the cheek, during cicatrization of the ulcerated parts. Frequently the conjunctiva is so much stretched, from the part where it is reflected over the eye-ball to its attachment at the edge of the tarsus, that the whole of the internal surface of the lower eye-lid is exposed to view.

Professor Scarpa is of opinion, that a complete cure can never be effected in this species of the disease, as that portion of the integuments which is destroyed cannot

be re-produced, and that consequently some degree of deformity must remain, after the most successful operation, by the greater or less exposure of the eye-ball, in proportion to the aggravation of the previous malady. He therefore recommends separating the whole internal membrane of the lower palpebra, by dissection, from its attachment to the edge of the tarsus, as near to its base as possible, and afterwards completely removing it. He objects to a simple division of the cicatrices, as he never, it would appear, witnessed a permanent elongation of the integuments produced by it. The contraction of the eyelid towards the eye-ball, after the cicatrization of the wound, I strongly suspect, will not be in general found sufficient to cure, or even materially to alleviate the disease, where the eversion and contraction of the integuments are considerable, since, besides the firm adhesions existing between the skin of the palpebra and cheek, from the lengthened state of the tarsus, some part of it must remain everted. A case of this kind, occasioned by a scald in the face, fell under my observation in the London Eye Infirmary, while I was a pupil, and acted as an assistant in that Institution. The conjunctiva was everted nearly half an inch, and gave the patient so much pain, when the eye was subjected to the influence of any irritating cause that he had for some time kept it bound up. Mr. Saunders proposed an operation, as the only means of affording relief, to which the man gladly assented. On the adhesion between the eye-lid and the cheek being carefully separated with a scalpel, the lid was replaced by the finger in its natural situation without any difficulty; but, the moment that support was withdrawn, it again fell back to its former position. By strips of adhesive plaster, the lid was kept up for some time tolerably well; but as soon as the wound began to heal, an union again took place between the divided parts, which produced nearly as much deformity as before. Having left London shortly after, I am ignorant whether any further effort was made to relieve the patient. The failure of success in this case appeared to me, in a great measure, to arise from a want of support to the eyelid to counteract the retractive disposition of the parts, during the cicatrization of the separated integuments; and had Mr. Saunders been then acquainted with the plan I have ventured to recommend, and which I some time after communicated to him, I think the result would have proved very different. In this species of disease I would recommend, that a free separation of the adherent parts should first be made in the manner practised by

Mr. Saunders, and afterwards the lid should be shortened, and brought into contact, as in a case of simple eversion. By the speedy union of the divided edges, the eye-lid will be retained in its place, and the danger of the integuments adhering to the cheek, be in a great measure prevented. The extended raw surface would most probably be covered by a new production of skin; but should even some degree of shortening of the integuments occur during the process of cicatrization, and the edge of the tarsus be again somewhat pulled downwards, it will then be reduced to that stage of the disease, where the caustic or scissors may be employed with advantage. Should any disposition to a relapse be observed during the progress of the cure, pressure may be made by means of a soft compress on the lid against the eye-ball, by means of a monocular bandage; and the after treatment should in every respect be the same as that directed in cases of simple eversion.

Sometimes the upper eye-lid also becomes everted from the same cause, which is still more unpleasant in appearance, and more distressing to the patient. Fortunately, however, this is but a rare occurrence, as in my practice, which has been very extensive, I have only witnessed a single instance of this complaint. The treatment should be similar to that above described in cases where this disease attacks the lower eye-lid.—]

ECTYLO'TICA. Medicines, which destroy callous indurations, and corns.

ECZEMA, or *ECZĒMA* (from *ἐκζέω*, to boil out.) A hot painful eruption, or pustule. Mr. Pearson calls the erythema mercuriale, *eczéma mercuriale*. (See *Mercury*.)

EDRA. A fracture, attended with an impression upon the bone, made by the instrument, which produced the accident.

EFFLORESCENCE. A redness of the skin.

EFFRACTURA. (from *effringo*, to break down.) A species of fracture, in which the bone is much depressed by the blow.

EFFUSION. (from *effundo*, to pour out.) In surgery, means the escape of any fluid out of the vessel, or viscus, naturally containing it, and its lodgment in another cavity, in the cellular substance, or in the substance of parts. Thus, when the chest is wounded, blood is sometimes effused from the vessels into the cavity of the pleura; in cases of false aneurisms, the blood gets out of the artery into the interstices of the cellular substance; in cases of fistula in perineo, the urine gets from the bladder and urethra into the

cellular membrane of the perineum and scrotum; and, when great violence is applied to the skull, blood is often effused even in the very substance of the brain.

Effusion also sometimes signifies the natural secretion of fluids from the vessels; thus surgeons frequently speak of the coagulable lymph being effused on different surfaces. (See *Extravasation*.)

ELCO'SIS. (from ἑλκος, an ulcer.) A term having the same meaning as ulceration.

ELECTRICITY. The following account of this subject, as it relates to surgery, is extracted from a work, that abounds with useful information, and has long been out of print: I mean the *Pharmacopoeia Chirurgica*, by an anonymous writer.

Among the aids of surgery, electricity once held a conspicuous and important situation. It has, however, met with a fate, not unusual with remedies too much cried up and too indiscriminately employed; that of having fallen, in a great degree, into neglect.

Whatever its effects, however, on the system may be, it certainly possesses this advantage over other topical remedies, that it may be made to act on parts very remote from the surface. By its application in repeated *shocks*, we are sometimes able to restore the action of those nerves, whose diseases may have impaired the senses; and by its use in the way of *friction*, or by drawing *sparks*, complaints of a more superficial nature are removed.

According to Mr. Birch, "the applications of the electric fluid to the diseases of the human body, may be all comprised under three heads. 1st. Under the form of *radii*, when projected from a point. 2d. That of a *spark*, when many of these *radii* are centered on a ball. 3d. Under that of a *globe*, when many of these sparks are condensed in a Leyden jar." (See *Adams's Essay on Electricity*.)

Under the first form, electricity is very advantageously applied, in inflammation of the eye, or any other highly sensible part.

Under the second, its action may be serviceable, in cases where the common skin can be stimulated with less reserve; as in local inflammations, sprain, bruises, contractions, tumours, paralytic affections, &c.

In the way of repeated shocks, it is likewise of service in the same cases; and is usually employed alternately with the other forms of electricity.

The electrical fluid, as a topical remedy, has been chiefly confined to the following diseases; viz. superficial inflam-

mation, ophthalmia, gutta serena, deafness, scrofulous enlargements, anomalous tumours, fistula lachrymalis, ulcers, cutaneous eruptions, cancers and abscesses.

Instances are upon record, of its success, in *suddenly* restoring the sight in gutta serena, the hearing in deafness, and the speech in dumbness, even of many years continuance. It is indeed the performance of a *miracle* of this sort *now and then*, that has led us to expect, what however no practitioner ever has found in it, a remedy, *uniform in its good effects*. It is peculiar perhaps to electricity, that it will sometimes do what is not at all expected from it, whilst, on the other hand, it is continually disappointing us in our common intentions. Perhaps the most accurate way in which we can speak of electricity as a remedy in local affections is that suggested by Mr. Abernethy, viz. that it has a tendency to promote *whatever action or process happens to be going on in a diseased part at the time of its application*.

Amongst the means employed to restore the vital functions, in cases of hanging, drowning, &c. electricity possesses a considerable share of importance; since, by proper management, the heart, lungs, brain and nerves, &c. may be subjected to its salutary stimulus. But its success in this, and indeed in every instance, will depend on the perfection of the apparatus employed, and the judgment of the operator in directing the force of the electric fluid.

In the *venereal disease*, electricity is said to be injurious; for what reason, has never yet been satisfactorily explained; neither indeed is the fact itself well ascertained. It ought to be observed, however, that there is a great singularity attending its use in those persons who are under the effects of a mercurial course. In these, the shock, or even the spark, is attended with considerable more pain than in common instances; and Mr. Hunter mentions the case of a person on whose complaint electricity had no effect, till mercury was administered, after which the same remedy produced a cure.

The discoveries of Galvani on the peculiar electricity of animal bodies, may possibly throw some light, in the course of time, on the *modus operandi* of the electrical fluid. At present, we are not acquainted with its properties, farther than the evidence we possess of its action as a stimulant. (*Pharm. Chirurg.*)

ELEVATOR. *Elevatorium*. An instrument for raising depressed portions of the skull.

Besides the common elevator, now generally preferred by all the best operators, several others have been invented; as,

for instance, the tripod elevator, and another, which was first devised by M. J. L. Petit, and afterwards improved by M. Louis.

The common elevator is an exceedingly simple kind of instrument, being in fact a mere lever, the end of which is somewhat bent, and made rough, in order that it may be less apt to slip away from the piece of bone, which is to be raised. This instrument may be used by forming a fulcrum for it, either in the hand, which holds it, or upon the fingers of the other hand; or the operator may make a fixed point for it on the edge of the opening made with the trephine, or of that, which the accidental violence has occasioned. In the first case, it has been objected, that the instrument cannot be employed with much force; the hand may give way; or, the elevator may slip from the bone, against which it presses, and thus produce a considerable concussion. In the second case, it is objected, that the part, on which the instrument is placed, may be forced inward.

Such were the reasons, which led to the invention of the tripod elevator, one piece of which consists of three branches uniting above into one common trunk. This last part of the elevator is pervaded by a long screw, having below a kind of hook, and above a sort of handle for turning it. It is with the hook, that the depressed portion of bone is to be elevated. It is to be introduced into the opening made in the cranium, as soon as the elevator has been put in a proper position; and it is to be made to ascend by turning the screw. Formerly, the tripod elevator was also sometimes used conjointly with a sort of screw, which was first fixed in the piece of bone about to be elevated, and then drawn upward, by placing the hook in a ring, that was attached to its upper part.

The inventors of the tripod elevator were certainly very well acquainted with the imperfections of the common one; and they endeavoured to obviate them, by procuring a firmer fulcrum, and a greater degree of power. But, it was necessary to change the situation of their elevator, as often as there was occasion to raise a different portion of bone; and the hook also being connected with an inflexible piece of steel, the direction of which was always the same as that of the instrument, it became troublesome and difficult, to place the hook under the piece of bone, which stood in need of being raised.

These inconveniences caused M. J. L. Petit to invent a new elevator. This consisted of a lever mounted on a handle, and

straight throughout its whole length, except just at its very end, which was slightly curved, in order that it might be more conveniently put under the portion of bone, which was about to be elevated. The lever was pierced at various distances from its bent end, with several holes, intended for the reception of a little kind of moveable screw-peg, which was fixed upon the top of a sort of bridge. This latter part of the instrument consisted of a kind of arch, the ends of which were long and covered with small pads, while, on its centre, was placed the little screw-peg already mentioned. It was the intention of M. Petit, that the peg should be joined to the bridge by means of a hinge; and as he found, that it was frequently necessary to elevate several different pieces of bone, he thought, that the peg should not be completely fastened in the hole, but that it should be capable of being moved about in any wished for direction. With this construction, however, it was found, that the peg would only allow the lever to be applied with its edge obliquely, and the bone about to be raised, when the point of the cranium was situated to the

or left. M. Louis conceived, that it would be with a great improvement of Petit's, by making a sort of pivot were substituted, during hinge. The lever would then be able to be readily moved in every and put under any point of bone, when the any occasion to alter the position by a bridge or fulcrum.

I have only to add, respecting the first, for fractures of the skull; that, till best modern surgeons content themselves with the common one, which is more simple, and in the hands of a surgeon, had knows how to use it, is found to answer every desirable purpose.

ELUXATIO. (from *eluxo*, to put out of joint.) A dislocation.

ELYTROCELE. (from *εγχελον*, the vagina, and *κηλη*, a tumour.) A hernia in the vagina.

EMBREGMA. (from *εμβρεχω*, to make wet.) An embrocation.

EMBROCATIO. (from *εμβρεχω*, to make wet.) *Embrocatio.* Strictly a fluid application made to any part of the body. Many use the term, however, synonymously with liniment. The following embrocations are noticed in the *Pharmacopœia Chirurgica*.

EMBROCATIO ALUMINIS. R. Aluminis ℥ij. Aceti spiritus vinosi tenuioris, sing. ℥ss. For chilblains, and diseased joints.

EMBROCATIO AMMONIÆ. R. Em-

brocat. ammon. Acet. cum sapone ʒij. Aq. ammon. pur. ʒij. M. For sprains and bruises.

EMBROCATIO AMMONIÆ ACETATÆ CAMPHORATÆ. ꝑ. Solut. saponis cum camphorâ, Aq. ammon. acet. sing. ʒj. Aq. ammon. pur. ʒss. M. For sprains and bruises. It is also frequently applied to disperse chilblains, which have not suppurated. Said to be the same as Steers' opodeldoc.

EMBROCATIO AMMONIÆ ACETATÆ. ꝑ. Aq. ammon. acet. Solut. sapon. sing. ʒj. M. For bruises with inflammation.

EMBROCATIO CANTHARIDIS CUM CAMPHORA. ꝑ. Tinct. cantharidis. Spirit. camph. sing. ʒj. M. This may be used in any case, in which the object is to stimulate the skin. The absorption of cantharides, however, may bring on a hæmaturgia.

EMBRYOTOMIA. (from *ἐμβρύον*, a fate, is, and *τεμνω*, to cut.) The operation of cutting into the womb, in order to expel the fœtus. (See *Cæsarean Operation*.)

EMOLLIENTS. (from *emollio*, to soften.) Such applications, as have the advantage of softening and relaxing parts.

EMPHYSEMA. (from *ἐμφυσαν*, to inflate.) Remote swelling produced by air being introduced into the cellular substance.

It is sometimes caused by this affection is nerves, wld. rib, by which the vesicles of the ser. being wounded, the air escapes of friction, them into the cavity of the plants of But, as the rib on being fractured, and pushed inwards, wounds the

Accor which lines the ribs and intercostal muscles, part of the air most commonly gets through the pleura, and those underated muscles into the cellular membrane, which is on the outside of the chest, and thence it is diffused through the same membrane over the whole body, so as to inflate it sometimes to an extraordinary degree. This inflation of the cellular membrane has been commonly looked upon as the most dangerous part of the disease; how justly, will appear in the sequel. (*Hewson, Med. Obs. and Inquiries, Vol. 3.*)

Emphysema is most frequent after a fractured rib, because there is, in this instance a wide laceration of the lungs, and no exit for the air; it is less frequent in large wounds with a knife, or broad sword, because the air has an open and unimpeded issue; it is again more frequent in deep stabs with bayonets, or small swords; and it is peculiarly frequent in gun-shot wounds, because the orifice in the skin inflames, and swells,

while the wound is wider within. (*John Bell on Wounds of the Breast.*)

The symptoms, attending emphysema, are generally the following kind. The patient at first complains of a considerable tightness of the chest, with pain, chiefly in the situation of the injury, and great difficulty of breathing. This obstruction of respiration gradually increases and becomes more and more insupportable. The patient soon finds himself unable to lie down in bed, and cannot breathe, unless when his body is in an upright posture, or he is sitting a little inclined forward. The countenance becomes red and swollen. The pulse, at first, weak and contracted, becomes afterwards irregular. The extremities grow cold, and, if the patient continue unrelied, he soon dies, to every appearance suffocated.

The emphysematous swelling, where-soever situated, is easily distinguished from œdema, or anasarca, by the crepitation, which occurs on handling it, or a noise, like that which takes place on compressing a dry bladder half filled with air. (*Encyclopédie Méthodique; Partie Chirurgicale, Art. Emphysema.*)

The wound of the pleura and intercostals may sometimes be too small to suffer the air to get readily into the cellular membrane, and to inflate it, but may confine a part of it in the cavity of the thorax, so as to compress the lungs, prevent their expansion, and cause the same symptoms of tightness of the chest, quick breathing, and sense of suffocation, which water does in the hydrops pectoris, or matter in the empyema. (*Hewson.*)

To understand, why the air passes at all out of the wound of the lungs, we must advert to the manner, in which inspiration and expiration are naturally carried on. It is well known, that in the perfect state, the surface of the lungs always lies in close contact with the membrane lining the chest, both in inspiration and expiration. The lungs themselves are only passive organs, and are quite incapable, by any action of their own, to expand and contract, so as to maintain their external surface constantly in contact with the inside of the thorax, which is continually undergoing an alternate change of dimensions. Every muscle, that has any concern in enlarging and diminishing the capacity of the chest, must contribute to the effect of adapting the volume of the lungs to the cavity, in which they are contained, as long as there is no communication between the cavity of the pleura, and the external air. In inspiration, the thorax

is enlarged in every direction, the lungs are extended in the same way, and the air entering through the wind-pipe into the air-cells of these organs, prevents the occurrence of a vacuum.

But, in cases of wounds, when there is a free communication between the atmosphere and inside of the chest, on this cavity being expanded, the air naturally enters it at the same time, and for the same reasons, that the air enters the lungs through the trachea, and the lung itself remains proportionally collapsed. When the thorax is next contracted, in expiration, the air is compressed out of the lung, and also, out of the bag of the pleura, through the external wound, if there be a direct one. In the latter circumstance, the emphysematous swelling is never very extensive.

But, in the case of a fractured rib, attended with a breach in the pleura costalis, pleura pulmonalis, and some of the air-cells of the lungs, there is no direct communication between the cavity of the chest and the external air; in other words, there is no outward wound in the parietes of the thorax. There is, however, a preternatural opening formed between the air-cells of the lungs and the cavity of the chest, and also another one between the latter space, and the general cellular substance of the body, through the breach in the pleura costalis. The consequence is, that, when the chest is expanded in inspiration, air rushes from the wound in the surface of the lungs, and insinuates itself between them and the pleura costalis. The lungs collapse in proportion, and the place, which they naturally occupied, when distended, is now occupied by the air. When, in expiration, the dimensions of the chest are every where diminished, the air, now lodged in the bag of the pleura, cannot get back into the aperture in the collapsed lung, because this is already full of air, and is equally compressed on every side, by that which is confined in the thorax. Were there no breach in the pleura costalis, this air could not now become diffused; the muscles of inspiration would next enlarge the chest, remove the pressure from the surface of the wounded lung, more air would be sucked out of it, as it were, into the space between the pleura costalis and pleura pulmonalis, and this process would go on, till the lungs of the wounded side were completely collapsed. But, in the case of a fractured rib, or of a narrow stab, in which there is also a breach in the pleura costalis, without any free vent outward, for the air, which gets out of the lung into the cavity of the pleura, as soon

as the expiratory powers lessen the capacity of the chest, this air, not being able to get back through the breach in the collapsed lung, passes through the laceration, or wound, in the pleura costalis, into the common cellular substance.

It is through the communicating cells of this structure, that the air becomes diffused most extensively over the whole body, in proportion as the expiratory muscles continue in their turn to lessen the capacity of the chest, and pump the air, as it were, through the breach in the pleura costalis, immediately after it has been sucked, as it were, out of the wound in the lung, in inspiration. (See *John Bell on Wounds of the Breast*, *Halliday on Emphysema*, 1807.)

To prove that the confinement of air in the chest is the cause of the dangerous symptoms attending emphysema, Mr. Hewson adverts to the histories of some most remarkable cases, published by M. Littre, M. Mery, Dr. Hunter, and Mr. Cheston. (See *Mem. de l'Acad. Royale des Sciences*, for 1713. *Med. Observations and Inquiries*, Vol. 2, and *Pathological Inquiries*.)

In M. Littre's case, the patient, who had been wounded in the side with a sword, could not breathe without making the most violent efforts, especially, during the latter part of his disease: he died on the fifth day.

In M. Mery's case, a man had the fourth and fifth true ribs broken by a coach passing over his chest, his respiration was much impeded from the first, and became more and more difficult, till he died, which was on the fourth day after the accident.

In Dr. Hunter's case, the patient had received a considerable hurt on his side by a fall from his horse. He had a difficulty of breathing, which increased in proportion as the skin became elevated and tense; it was laborious as well as frequent. His inspiration was short, and almost instantaneous, and ended with a catch in the throat, which was produced by the shutting of the glottis; after this he strained to expire for a moment without any noise, then suddenly opening the glottis, he forced out his breath with a sort of groan, and in a hurry, and then quickly inspired again; so that his endeavours seemed to be to keep his lungs always full; inspiration succeeded expiration as fast as possible. He said, his difficulty of breathing was owing to an oppression or tightness across his breast, near the pit of the stomach. He had a little cough, which exasperated his pain, and he brought up blood and phlegm

from his lungs. He was relieved by scarifications, and recovered.

In Mr. Cheston's case, the man had received a blow on the chest. He had a constant cough, bringing up, after many ineffectual efforts, a frothy discharge, lightly tinged with blood; he seemed to be in the greatest agonies, and under a constant appearance of suffocation. His pulse was irregular, and sometimes scarcely to be felt, his face livid, and, when he was sensible, which was only now and then, he complained of a pain in his head. On passing a bandage round his chest, with a proper compress to prevent the discharge of air into the cellular membrane, and to confine the motion of the thorax, the patient cried out, that he could not suffer it. A strong compression by the hand alone affected him in the same way. Notwithstanding, bleeding, repeated scarifications, and other means, his sense of suffocation, and difficulty of breathing increased. On the fourth day, the air no longer got into the cellular membrane, when on a sudden inclining his head backward as it were, for the admission of more air, than usual, his breathing became more difficult and interrupted, he turned wholly insensible, and soon afterwards died.

M. Littré, M. Mery, and Mr. Cheston, opened their patients after death.

M. Littré, besides a wound of the lungs and fractured rib, found a considerable quantity of blood in the cavity of the thorax, and was sensible of some putrid air escaping, on his first puncturing the intercostals and pleura. The wounded lobe was hard and black, and the other two of the same side were inflamed.

In M. Mery's patient, no blood was extravasated, nor was there any thing preternatural, except the fractured ribs, the wound of the pleura, and that of the lungs.

Mr. Cheston found a fracture of the tenth and eleventh ribs, and a wound of the lungs. The lungs, below the wound, were livid, and more compact, than usual; but every thing else was natural, no extravasation, no inflammation, no internal emphysema.

Mr. Hewson made experiments on animals to shew, that air in their chests produced great difficulty of breathing, such as occurs in cases of emphysema, and in one case, which he examined after death, air was actually discharged on puncturing the thorax.

The object of Mr. Hewson's paper is to recommend making an opening into the chest, for the purpose of giving vent to the air confined in that cavity, just as is done for the discharge of pus, in cases of

empyema, and water, in those of hydrops pectoris.

In wounds of the lungs, says this author, whether occasioned by fractured ribs, or other causes, when symptoms of tightness and suffocation come on, so far should we be from dreading the emphysematous swelling of the cellular membrane, that we should rather consider it, as a favourable symptom, shewing that the air is not likely to be confined in the thorax; and so far should we be from compressing the wound to prevent the inflation, or emphysema, that we should rather dilate it (if not large enough already,) or perform the paracentesis thoracis. We may judge of the necessity of this operation from the violence of the symptoms, such as the oppressed breathing, &c. For when these are not considerable, and the air gets out of the chest with sufficient freedom, the operation then becomes unnecessary.

The best place for performing the operation, says Mr. Hewson, if the disease is on the right side, will be on the fore-part of the chest, between the fifth and sixth ribs; for, there the integuments are thin, and, in the case of air, no depending drain is required. But, if the disease is on the left side, it will be more advisable to make the opening between the seventh and eighth, or eighth and ninth ribs, that we may be sure of avoiding the pericardium. As large penetrating wounds are inconvenient on account of the air entering by the aperture in such a quantity, as to prevent the expansion of the lungs, a small wound will be eligible, and especially as air does not require a large one for its escape. Mr. Hewson recommends dissecting cautiously with a knife, in preference to the coarse and hazardous method of thrusting in a trocar.

There is one error, prevailing in Mr. Hewson's paper, for which he has been justly criticized by Mr. John Bell; viz. the idea, that it is possible and proper to make the collapsed lung expand by making an opening into the chest, in cases of emphysema. Bromfield and B. Bell have both imbibed the same erroneous opinions, and proposed plans for exhausting the air and expanding the lung. It is very certain, that it is impracticable to make the collapsed viscus expand, until the breach in it is closed, and this closure is greatly promoted by the quiet state, in which the collapsed lung remains; a state, also, the most favourable for the stoppage of any bleeding from the pulmonary vessels.

The true object then of making an opening into the thorax, when the symptoms of suffocation are very violent in

cases of emphysema, is not to obtain an expansion of the lung on the affected side, nor to take the pressure of the air from it; but, to remove the pressure caused on the opposite lung by the distention of the mediastinum, and, at the same time, to diminish the pressure of the air on the diaphragm. The lung on the affected side must continue collapsed, and it is most advantageous, that it should do so. The opposite lung is that, which for a time must of itself carry on respiration, and it is known to be fully adequate to this function, provided the quantity of air, on the other side of the chest, does not produce too much pressure on the mediastinum, and diaphragm.

Mr. John Bell concludes his remarks on this subject, with advising the following practice. 1st. Upon observing the crackling tumour beginning to form itself over a fractured rib, you should make small punctures with the point of a lancet, as in bleeding; and if the point be struck deep enough, the air will rush out audibly. But, as this air was in the thorax, before it came into the cellular substance, it is plain, that the thorax is still full, and that the lung of that side is already collapsed and useless, and must continue so. The purpose, therefore, of making these scarifications, and, especially, of making them so near the fractured part, is not to relieve the lungs, but, merely, to prevent the air spreading more widely beneath the skin.

2nd. If, before you arrive, the air shall have spread to very remote parts of the body, as to the scrotum, and down the thighs, it will be easier to make small punctures in those parts, to let out the air directly, than to press it along the whole body, till you bring it up to the punctures made on the chest, over the wounded part.

3rd. If, notwithstanding free punctures, and pressing out the air in this way, you should find by the oppression, that either air, or blood, is accumulating within the cavity of the thorax, so as to oppress not the wounded lung only, which was of course collapsed and useless from the first, but so as to oppress also the diaphragm, and through the diaphragm to affect also the sound lung; then a freer incision must be made, through the skin and muscles, and a small one delicately into the thorax to let out the confined air, or blood. (*John Bell.*)

After a few days, the wound, in the collapsed lung, becomes closed by the adhesive inflammation around it, so that the air no longer gets out of it into the cavity of the chest, and any extensive opening may be healed. What air is already there

is ultimately absorbed, and the lung, expanding in proportion, resumes its original functions. Emphysema has been known to arise from the bursting of a vomica, and ulceration of the surface of the lungs; but, the air, which escapes, in this instance, cannot find its way into the cavity of the thorax, because the inflammation, which precedes the abscess and ulceration of the air-cells, closes those which are adjacent, and produces an adhesion of the edges of the vomica, or ulcer, to the inner surface of the chest, so as entirely to separate the two cavities. We are not acquainted with any instance of the symptoms, imputed to the confinement of air in the chest, originating from suppuration and ulceration of the surface of the lungs; but, Palfyn, Dr. Hunter, and the author of the article *Emphysema*. in the *Encyclopédie Méthodique*, *Partie Chirurgicale*, have seen cases, in which emphysema has arisen from abscesses of the lungs, attended with adhesion to the pleura, and ulcerations in the situation of such adhesion. In these instances, the pus having made its way through the pleura and intercostal muscles, the air escapes also through the same track, so as to get into the cellular membrane on the outside of the chest.

A violent effort of respiration has, sometimes, produced a certain degree of emphysema, which first makes its appearance about the clavicles, and afterwards spreads over the neck and adjacent parts. The efforts of labour have been known to occasion a similar symptom; but, no bad consequences followed. (*Medical Communications*, p. 176, and *Wilner's Obs. in Surgery*, p. 143.)

M. Louis has described an emphysema of this sort, which, on account of its cause, and the indication, which it furnishes to the practitioner, is highly important. This famous surgeon had occasion to remark it in a young girl, who died suffocated, from a bean falling into her windpipe, and he considers it, as a pathognomonic symptom of such an accident, concerning the existence of which it is so essential not to commit any mistake. (See *Bronchotomy*.) This emphysema made its appearance on both sides of the neck, above the clavicles, and came on suddenly, on the third day after the accident. The inspection of the body proved, that the lungs and mediastinum were also in an emphysematous state. The retention of the air, confined by the foreign body, produced, says M. Louis, at each attempt to expire, and, especially, when the violent fits of coughing occurred, a strong propulsion of this fluid towards the surface of the lung, into the spongy substance

of this viscus. Thence, the air passed into the cellular texture, which unites the surface of the lung to the pleura pulmonalis; and, by communications from cells to cells, it caused a prodigious swelling of the cellular substance, between the two layers of the mediastinum. The emphysema, increasing, at length made its appearance above the clavicles. This tumefaction of the lung, and surrounding parts, in consequence of air getting into their spongy, and cellular texture, is an evident cause of suffocation, and, the swelling seems so natural an effect of the presence of a foreign body in the trachea, that one can hardly fail to think it an essential symptom, though no author has made mention of it. (*Mémoires de l'Acad. de Chirurgie; Tom. 4, in 4to.*)

An emphysematous swelling of the head, neck, and chest, has also been noticed in typhoid fevers. Dr. Huxham relates an instance, of this sort, in a sailor of a scorbutic habit. (*Medical Observations and Inquiries, Vol. 3, Art. 4.*) A case of spontaneous emphysema has likewise been described by Dr. Baillie. (See *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, Vol. 1, p. 202.*)

A curious example of what has been called, a spontaneous emphysema, is recorded by Mr. Allan Burns: "The patient was a strong athletic man, who, about six years previous to his application at the Royal Infirmary, had received a smart blow on the neck, from the keel of a boat. This injury was soon followed by the formation of a firm tense tumour, on the place, which had been hurt. The swelling increased very slowly, during the five years immediately succeeding its commencement; but, during the sixth, it received a very rapid addition to its bulk. At this time, it measured nearly six inches in diameter, seemed to be confined by a firm and dense covering, and the morbid parts had an obscure fluctuation. From the first to the last, the tumour had been productive of very little pain.

"Judging from the apparent fluctuation, that the tumour was encysted, it was resolved, at a consultation, to puncture the swelling, draw off its contents, and then pass a seton through it. By plunging a lancet into it, only a very small quantity of blood, partly coagulated, and partly fluid, was discharged,—a quantity so trifling, that, after its evacuation, the size of the tumour was not perceptibly reduced. A seton was passed through the swelling. At this time, the man was in perfect health.

"About ten hours after the operation,

the patient was seized with extremely violent rigors, followed by heat, thirst, pain in the back, excessive pain in the tumours and oppressive sickness.

"An emetic was prescribed, but, instead of producing vomiting, it operated as a cathartic. To remove the irritation the seton was withdrawn. The pain in the tumour, however, and the general uneasiness continued to increase, and thirty hours subsequent to making the puncture, air began to issue from the track of the seton; and, afterwards the cellular membrane of the neck, and of the other parts of the body in succession, became distended with a gaseous fluid. In the course of a few hours, after the commencement of the general emphysema, the man died.

"Twelve hours after death, when the body was free from putrefaction, it was inspected. The emphysema was neither increased, nor diminished since death, and some idea may be formed of its extent, when the scrotum was distended to the size of the head of an adult. Even the cavities of the heart, and the canals of the blood-vessels, contained a considerable quantity of air. We could discover no direct communication between the tumour and the trachea or lungs, although such was carefully sought for." (*A. Burns on the Surgical Anatomy of the Head and Neck, p. 51—53.*)

From such cases, we may infer, with the preceding writer, that from the mere rupture of a few of the bronchial cells, occasioned by irregular action of the lungs, or by some other internal cause, a spontaneous diffusion of air may take place in the cellular texture of the body. Such examples are dependent on the same cause as the emphysema from injury of the lungs; only the rupture of the bronchial cells in the former cases is less obvious.

Surgeons often observe a partial emphysema, in cases of gangrene.

Here, however, it is hardly necessary to observe, the air is the product of putrefaction, and the disorder has not the smallest connexion with any injury, or disease of the air-cells of the lungs.

The reader may consult, with advantage, *l'Encyclopédie Méthodique, Partie Chirurgicale. Newton's Paper in Medical Observations and Inquiries, Vol. 3. Mem. de l'Acad. Royale des Sciences, for 1713. Dr. Hunter in Medical Observations and Inquiries, Vol. 2. Cheston in Pathological Inquiries. A Case in Abernethy's Works. John Bell on Wounds of the Breast. Halliday on Emphysema, 1807. Allan Burns on the Surgical Anatomy of the Head and Neck, p. 52, &c. Transactions of a Society for the*

Improvement of Medical and Chirurgical Knowledge, Vol. 1, p. 202. Wilner's Observations in Surgery, p. 143. Richerand's Nosographie Chirurgicale, Tom. 4, p. 164, Edit. 2. Lassus Pathologie Chirurgicale, Tom. 2, p. 321, &c. Edit. 1809.

EMPLASTRUM. (from *εμπλασσω*, to spread upon.) A plaster.

The following are some of the most useful plasters, employed in surgery.

EMPLASTRUM AMMONIACI CUM ACETO. *℞.* Ammoniaci \mathfrak{z} ij. Aceti Distillati \mathfrak{z} ij. Ammoniacum in aceto liquefactum evapora in vase ferreo ad emplastri crassitudinem.

EMPLASTRUM AMMONIACI SCILLITICUM. *℞.* Gum. ammoniaci \mathfrak{z} j. Aceti Scillitici, q. s. ut fiant emplastrum, quod pars affecta tegatur.

Mr. Ford has found this last plaster useful in some scrofulous affections. It may be rendered more stimulating by sprinkling it with squills. (*Ford on the Hip-joint, p. 59.*) It has been recommended by Swediaur; *London Medical Journal, Vol. 1, p. 198.*

The first plaster partakes of the same stimulating property, though in a milder degree.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO. Discutient.

EMPLASTRUM AMMONIACI CUM CICUTA. *℞.* Gum. ammon. \mathfrak{z} ij. Succicicutæ spissatæ \mathfrak{z} j. Aq. litharg. acet. \mathfrak{z} j.

Dissolve the ammoniacum in a little vinegar of squills, then add the other ingredients, and boil them all slowly to the consistence of a plaster. This is discutient.

EMPLASTRUM AMMONIÆ. *℞.* Sapon. \mathfrak{z} ij. Emplast. litharg. \mathfrak{z} ss. Ammon. mur. \mathfrak{z} j.

The two first articles are to be melted together, and when nearly cold, the muriated ammonia, finely powdered, is to be added. Its use is to stimulate the skin, and excite the action of the absorbents. Hence, it disperses many chronic swellings and indurations.

EMPLASTRUM CANTHARIDIS VEL LYTTE. (See *Blister*.)

EMPLASTRUM GALBANI COMPOSITUM. L. P. (*Olim emplastrum lithargyri comp.*) Properties discutient.

EMPLASTRUM HYDRARGYRI. L. P. (*Olim emplastrum litharg. cum hydrargyro.*) Properties discutient.

EMPLASTRUM LYTTE. L. P.—(See *Blister*.)

EMPLASTRUM PLUMBI. L. P.—(*Olim emplastrum lithargyri, or diachylon plaster.*)

EMPLASTRUM RESINÆ. L. P.—

(*Olim emplastrum lithargyri cum resina.*) The common adhesive, or sticking plaster.

EMPLASTRUM SAPONIS. The plaster commonly used for fractures. It is also frequently applied to bruised parts, and to many indurations of a chronic nature.

EMPROSTHOTONOS. (from *εμπροσθεν*, before or forwards, and *τεινω*, to extend.) A spasmodic, or tetanic, affection, in which the body is bent forwards.

EMPYEMA. (from *εν*, within, and *πυον*, pus, or matter.) A collection of purulent matter in the cavity of the chest.

The ancients made use of the word, "empyema" to express every kind of internal suppuration. It was *Ætius*, who first restricted the term to the collections of matter, which sometimes form in the cavity of the pleura, or membrane lining the chest; and all the best modern surgeons invariably attach this meaning alone to the expression.

The operation for empyema properly means the making of an opening into the thorax, for the purpose of giving vent to the matter, collected in the cavity of the pleura, though the phrase with several writers denotes making an incision into the chest, in order to let out any effused, or confined fluid, whether matter, blood, an aqueous fluid, or even air. The necessity for having recourse to such an operation, however, does not often present itself. I would not wish to be supposed to assert, that inflammation of the lungs, pleura, mediastinum, diaphragm, and even of the liver, does not sometimes terminate in suppuration. Certainly, the latter event is occasionally produced; but, when it does happen, the matter does not always make its way into the cavity of the chest. Very frequently external abscesses form, or the pus is either coughed up, or discharged with the stools.

When the surface of the lungs and that of the pleura costalis have become adherent to each other, in the situation of the abscess, the pus, always disposed by a law of nature to make its way to the surface of the body, occasions ulceration of the intercostal muscles, and collects on the outside of them. An abscess of this kind comes on with a deep seated pain in the part affected; an œdematous swelling, which retains the impression of the finger; and a fluctuation, which is at first not very distinct, but, from day to day, becomes more and more palpable, and, at length, leads the surgeon to make an opening.

If an opening be not made, when the

fluctuation becomes perceptible, there is some risk of the matter insinuating itself into the cavity of the pleura, in consequence of the adhesion being in part destroyed by ulceration. M. Sabatier affirms, that the case may take this course, even when the abscess has been punctured, and while a free external opening exists; and this experienced surgeon has adduced a case in confirmation of such an occurrence. (See *Médecine Opératoire*, Tom. 2, p. 249.)

In the same manner, if inflammation should occur in the anterior mediastinum, and end in suppuration, the abscess may possibly burst into neither of the cavities of the chest; but, make its way outward, after having rendered the sternum carious, as happened in the example, recorded by Van Swieten. (*Comment. on Boerhaave's 895th Aphorism.*)

External injuries, such as the perforation of the sternum with a sword, (*Vanderviel, Obs. 19, Cent. 1.*) a contusion, a fracture, or a caries of this bone, may give rise to an abscess in the anterior mediastinum. Galen has recorded a memorable example, where the abscess was the consequence of a wound of the forepart of the chest. After the injury, which was in the region of the sternum, seemed to have got quite well, an abscess formed in the same situation, and being opened healed up. The part, however, soon inflamed and suppurated again. The abscess could not now be cured. A consultation was held, at which Galen attended. As the sternum was obviously carious, and the pulsation of the heart was visible, every one was afraid of undertaking the treatment of the case, since, it was conceived, that it would be necessary to open the thorax itself. Galen, however, engaged to manage the treatment, without making any such opening, and he expressed his opinion, that he should be able to effect a cure. Not finding the bone so extensively diseased, as was apprehended, he even indulged considerable hopes of success. After the removal of a portion of the bone, he saw the heart quite exposed, (as is alleged) by reason of the pericardium having been destroyed by the previous disease. After the operation, the patient experienced a speedy recovery.

J. L. Petit met with a case of an abscess in the anterior mediastinum, in consequence of a gun-shot wound in the situation of the sternum. The injury had been merely dressed with some digestive application; no dilatation, nor any particular examination of the wound had been made. The patient, after being to all appearances quite well, and joining his regiment again, was soon taken ill

with irregular shiverings, and other febrile symptoms. M. Petit probed the wound, and found the bone affected. As there was a difficulty of breathing, he suspected an abscess either in the diploe, or behind the sternum, and, consequently, he proposed laying the bone bare, and applying a trepan. This operation gave vent to some sanious matter, and, as soon as the inner part of the sternum was perforated, a quantity of pus was discharged. The patient was relieved, and afterwards recovered. (See *Petit's Traité des Maladies Chirurgicales*, Tom. 1, p. 80.)

When, in consequence of inflammation, an abscess forms deeply in the substance of the lungs, the pus more easily makes its way into the air-cells, and tends towards the bronchia, than towards the surface of the lungs. In this case, the patient spits up purulent matter. When the opening, by which the abscess has burst internally, is large, and the pus escapes from it in considerable quantity at a time, the patient is in some danger of being suffocated. However, if the opening be not immoderately large, and the pus, which is effused, be not too copious, a recovery may ensue. Abscesses in the substance of the diaphragm, and collections of matter in the liver, may also be discharged by the pus being coughed up from the trachea, when the parts affected have become connected with the lungs by adhesions, and abscesses of the liver are situated on its convex surface. When the collection of matter in the liver occupies any other situation, the abscess frequently makes its way into the colon, and the pus is discharged with the stools. Several cases of this kind are related by authors: Sabatier has recorded two in his *Médecine Opératoire*; Le Dran makes mention of others; and Pemberton, in his book on the Diseases of the Abdominal Viscera, p. 36, relates the occurrence of additional instances of a similar nature.

Acute and chronic abscesses not unfrequently form in the cellular substance, between the pleura and the ribs and intercostal muscles. A swelling occurs between two of those bones; the skin does not undergo any change of colour; a fluctuation is distinguishable, and sometimes an extensive œdema is observable. Such abscesses should be opened; the motions of respiration then both promote the exit of the matter, as well as the contraction of the cavity, in which it was lodged; and the disease, if unattended with caries, generally terminates favourably.

It often happens, however, that the ribs are carious, and then the cure is more tedious and difficult. A modern writer, indeed, informs us, that, when the inside

of the rib is extensively carious, or when the caries is near the junction of the bone to the spine, the fistula is incurable. (*Lassus Pathologie Chirurgicale*, Tom. 1, p. 128, Edit. 1809.) On the other hand, another surgeon of vast experience recommends us, to endeavour to separate the diseased bone, either by cutting it away, or employing the trepan. (*Pelletan's Clinique Chirurgicale*, Tom. 3, p. 253.) Were a part of a diseased rib to admit of being sawn away, Mr. Hey's convex saw would be a more proper instrument for the purpose, than a trepan.

An abscess of the preceding kind may be so situated, and attended with such a pulsation, as greatly to resemble an aneurism of the origin of the aorta. An interesting case of this description is detailed by M. Pelletan, Tom. 3. p. 254. I shall now proceed to the consideration of empyema strictly so called. No surgical writer, with whom I am acquainted has treated, with more discrimination, than Mr. Samuel Sharp, of the symptoms produced by collections of matter in the chest. He remarks, that it has been almost universally taught, that, when a fluid is extravasated in the thorax, the patient can only lie on the diseased side, the weight of the incumbent fluid on the mediastinum becoming troublesome, if he places himself on the sound side. For the same reason, when there is fluid in both cavities of the thorax, the patient finds it most easy to lie on his back, or to lean forwards, in order that the fluid may neither press upon the mediastinum, nor the diaphragm. But, it is noticed by Mr. Sharp, that, however true this doctrine may prove in most instances, there are a few, in which, notwithstanding the extravasation, the patient does not complain of more inconvenience in one posture, than another, nor even of any great difficulty of breathing. (See *Le Dran's Obs.* 217, and *Marchetti* 65)

On this account, observes Mr. Sharp, it is sometimes less easy to determine, when the operation is requisite, than if we had so exact a criterion, as we are generally supposed to have. But, says he, though this may be wanting, there are some other circumstances, which will generally guide us with a reasonable certainty. He states, that the most infallible symptom of a large quantity of fluid in one of the cavities of the thorax, is a preternatural expansion of that side of the chest, where it lies; for, in proportion as the fluid accumulates, it will necessarily elevate the ribs on that side, and prevent them from contracting so much in expiration as the ribs on the other side. Mr. Sharp also refers to Le Dran's Ob-

serv. 211, vol. 1, in order to prove, that, the pressure of the fluid on the lungs may sometimes be so great, as to make them collapse, and almost totally obstruct their function. When, therefore, says Mr. Sharp, the thorax becomes thus expanded, after a previous pulmonary disorder, and the case is attended with the symptoms of a suppuration, it is probably owing to a collection of matter. The patient, he observes, will also labour under a continual low fever, and a particular anxiety from the load of fluid.

Besides this dilatation of the cavity from an accumulation of the fluid, the patient will be sensible of an undulation, which is sometimes so evident, that a by-stander can plainly hear it in certain motions of the body. Mr. Sharp adds, that this was the case with a patient of his own, on whom he performed the operation; but, the fluid in this instance, he says, was very thin, being a serous matter, rather than pus.

According to the same author, it will also frequently happen, that though the skin and intercostal muscles are not inflamed, they will become œdematous in certain parts of the thorax; or, if they are not œdematous, they will be a little thickened. These symptoms, joined with the enlargement of the thorax, and the preceding affection of the pleura, or lungs, seem unquestionably to indicate the propriety of the operation. But, observes Mr. Sharp, amongst other motives to recommend it upon such an emergency, this is one, that if the operator should mistake the case, an incision of the intercostal muscles would neither be very painful, nor dangerous. (See *Critical Enquiry into the present State of Surgery*, sect. on *Empyema*.)

"The difficulty of lying on the side, opposite to the collection of pus," says Le Dran, "is always accounted a sign of an empyema. This sign, indeed, is in the affirmative; but, the want of it does not prove the negative; because, when there is adhesion of the lungs to the mediastinum, the patient may lie equally on both sides." (*Le Dran's Obs.* p. 108, Edit. 2.) The explanation of this circumstance, offered by Le Dran, is, that, when the cyst, in which the matter is contained, is between the mediastinum and the lungs, the mediastinum gradually yields to the volume of the pus, in proportion as it is formed, and the cyst in which it is contained becomes dilated; "whence habitude becomes a second nature." Whereas, in an empyeal person, in whom the lung is not adherent to the mediastinum, and who lies on the side opposite to that, on which the collection of pus is situated,

the mediastinum is on a sudden loaded with an unusual weight of fluid. (P. 111.)

Richerand contends, that the difficulty of breathing, which patients with extravasated fluid in the chest experience in lying upon the side, opposite that on which the disease is situated, never originates, as has been commonly taught and believed, from the fluid pressing upon the mediastinum and opposite lung. "I have, (says he) produced artificial cases of hydrothorax, by injecting water into the thorax of several dead subjects, through a wound made in the side. This experiment can only be made on subjects, in which the lungs are not adherent to the parietes of the chest. In this way, from three to four pints of water were introduced. I then cautiously opened the opposite side of the chest: the ribs and lungs being removed, the mediastinum could be distinctly seen, reaching from the vertebrae to the sternum, and supporting, without yielding, the weight of the liquid, in whatever position the body was placed.

"It is evident, then, that patients, with thoracic extravasations, lie on the diseased side, in order not to obstruct the dilatation of the sound side of the respiratory organs, one part of which is already in a state of inaction. It is for the same reason, and in order not to increase the pain by the tension of the inflamed pleura, that pleuritic patients lie on the diseased side. The same thing is observable in peripneumony; in a word, in all affections of the parietes of the chest." (*Richerand, Nosographie Chirurgicale, Tom. 4, p. 168, 169, Edit. 2.*)

It appears to me, that there may be some truth in the foregoing statement; but, the experiments are far from being conclusive, with respect to the assertion, that, in cases of empyema, hydrothorax, &c. the fluid on one side of the chest does not compress the opposite lung. In the first place, the quantity of fluid is frequently much larger, than that which Richerand injected. Secondly, although the mediastinum may not be apt to yield at once to the weight of a liquid suddenly injected into one side of the thorax; yet, it may do so by the gradual effect of disease. Thirdly, many of the phenomena of emphysema seem adverse to Richerand's inference.

Although surgeons should be aware, that patients with empyema can sometimes lie in any position, without particular aggravation of the difficulty of breathing, yet, it ought to be distinctly understood, that the generality of patients with this disease cannot place themselves on the side, opposite to that, on which the collection of pus is situated, without hav-

ing their respiration very materially obstructed. Another circumstance, also, which deserves to be mentioned while we are treating of the symptoms of empyema, is, that the œdema of the integuments is sometimes not confined to the thorax, but extends to more remote parts, on the same side of the body as the collection of matter. Both the foregoing remarks are confirmed by an interesting case, which has been published by Mr. Hey, of Leeds.

Sep. 3, 1788, Mr. Hey was desired to visit John Wilkinson, who had been ill ten days of the influenza. The patient was found labouring under a fever, attended with cough, difficulty of breathing, and pain in the left side of the thorax. He was bled once; had repeated blisters applied to the chest; and took nitre and antimonials, with a smooth linctus to allay his cough. He was repeatedly relieved by these means, especially by the application of the blisters; but, repeatedly relapsed. At last, he became so ill, that he breathed with the utmost difficulty, and "could not lie on the right side, without danger of immediate suffocation."

Mr. Hey found the patient in the state, just now described, on the 17th of September. "His face and especially his eyelid were a little swollen on the left side." The left side of the thorax was larger, than the right, and its integuments were œdematous. Upon pressing the intercostal muscles, they felt distended; they yielded a little to a strong pressure, but rebounded again. The abdomen, especially, at its upper part, appeared to be fuller, than in the natural state. (*See Hey's Practical Observations in Surgery, p. 476.*)

Another remarkable symptom, which is occasionally produced by collections of matter in the chest, is an alteration in the position of the heart. I have seen a patient in St. Bartholomew's hospital who had so large a quantity of matter in the left bag of the pleura, that it completely displaced the heart, which pulsated against the inside of the chest, at a considerable distance to the right of the sternum. This man's life might probably have been saved, had paracentesis thoracis been performed in time. Some suspected an aneurism from the throbbing on the right of the sternum; and the case was not fully understood till after death, when the body was opened. A little attention to the symptoms, however, might have convinced any man of moderate understanding, that it was an empyema, and that making an opening, for the discharge of the matter, afforded the only rational chance of preserving life. There had

been pain and inflammation in the chest, followed by shiverings; there was very great difficulty of breathing; the heart, which previously used to beat in the usual place, no longer did so; but, now, pulsed on the right side of the thorax.

That the heart should be displaced in this manner by any large collection of fluid in the right cavity of the thorax, one would naturally expect; but, it is an occurrence, that has not been much noticed by surgical writers. M. Larrey, however, has related a highly interesting case, in which it happened. Indeed, not only was the heart pushed considerably to the right of the sternum, but, its action was so much impeded by the derangement of its position, that the pulse in the large arteries was thereby rendered extremely feeble. In this instance, also, the diaphragm had descended so low down, as to force some of the small intestines into the cavity of the pelvis (See *Larrey's Mémoires de Chirurgie Militaire*, Tom. 3, p. 447, &c.) Pelletan has also recorded an example, in which a collection of fluid in the left cavity of the chest displaced the heart, the pulsations of which were perceptible betwixt the third and fourth ribs, of the right side, near the sternum. (*Pelletan's Clinique Chirurgicale*, Tom. 3, p. 276.)

The symptoms of empyema are frequently very equivocal, and the existence of the disease is generally somewhat doubtful. Panarolius opened a man, whose left lung was destroyed, at the same time that the thorax contained a considerable quantity of pus. Although the patient had been ill for two months, he had suffered no difficulty of breathing, and had had only a slight cough. Le Dran met with a case of nearly the same kind. A patient, who had been, for three days, affected with a considerable oppression, and an acute pain on the left side of the chest, got somewhat better. He felt no material difficulty of breathing, on whatever side he lay. The only thing, which he complained of, was a sense of a fluctuation in his thorax, and a little obstruction of his respiration, when he was in a sitting posture. These symptoms did not seem sufficiently decided to justify the operation, and it was delayed. The febrile symptoms continued with cold sweats, and the patient died on the eighth day. Five pints of pus, were found collected in the chest. (See *Le Dran's Observations in Surgery*, p. 109, 110, Edit. 2.)

As the operation of empyema, and some other particulars, relating to this subject, are treated of in another part of this Dictionary, (See *Paracentesis of the Thorax*.) it will only be necessary for me

here to subjoin a list of works, which may be advantageously consulted for information on empyema. *Sharp's Critical Enquiry into the Present State of Surgery, sect on Empyema. Le Dran's Observations in Surgery. Petit's Traité des Maladies Chirurgicales*, Tom. 1, Chap. 3, *Des Plaies de Poitrine. Warner's Cases in Surgery*, Chap. 6, Edit. 4. *Mémoire sur l'Opération du Trépan au Sternum par M. de la Martinière in Mém. de l'Acad. Royale de Chirurgie*, Tom. 12, p. 342, Edit. in 12mo. *Subatier's Médecine Opératoire*, Tom. 2, p. 247, &c. Edit. 1. *Richerand's Nosographie Chirurgicale*, Tom. 4, sect des Maladies de l'Appareil respiratoire. *Levéillé, Nouvelle Doctrine Chirurgicale*, Tom. 2, p. 575, &c. *Hey's Practical Observations in Surgery. Lassus, Pathologie Chirurgicale*, Tom. 1, p. 122, &c. *Larrey, Mémoires de Chirurgie Militaire*, Tom. 3, p. 442, &c. *Pelletan, Clinique Chirurgicale*, Tom. 3, p. 236, &c.

ENCANTHIS. (from *εν*, and *κανθος*, the angle of the eye.)

The encanthis, at its commencement, is nothing more, says Scarpa, than a small, soft, red, and sometimes rather livid, excrescence, which grows from the caruncula lachrymalis, and, at the same time, from the neighbouring semilunar fold of the conjunctiva. The inveterate encanthis is ordinarily of a very considerable magnitude; its roots extend beyond the caruncula lachrymalis, and semilunar fold, to the membranous lining of one, or both eyelids. The patient experiences very serious inconvenience from its origin, and interposition between the commissure of the eyelids, which it necessarily keeps asunder, on the side towards the nose.

The encanthis keeps up a chronic ophthalmia, impedes the action of the eyelids, and prevents in particular the complete closure of the eye. Besides, partly by compressing, and partly by displacing the orifices of the puncta lachrymalia, it obstructs the free passage of the tears into the nose.

This excrescence, on its first appearance, (continues this eminent writer,) is commonly granulated, like a mulberry, or is of a ragged, and fringed structure. Afterwards, when it has acquired a certain size, one part of it represents a granulated tumour, while the rest appears like a smooth, whitish, or ash-coloured substance, streaked with varicose vessels, sometimes advancing as far over the conjunctiva, covering the side of the eye next to the nose, as where the cornea and sclerotica unite. In this advanced state, the encanthis constantly interests the caruncula lachrymalis, the semilunar fold, and the membranous lining of one, or both

eyelids. In addition to the roots, which in such circumstances connect the excrescence with the caruncula lachrymalis, the semilunar fold, and the conjunctiva of the globe of the eye, the encanthis emits an appendage, or prominent, firm elongation, along the inside of the upper, or lower eyelid, in the direction of its edge. The middle, or body, of the encanthis divides near the cornea, as it were, like a swallow's tail, to form two appendages, or elongations, one of which extends along the inner surface of the upper eyelid by the margin of which it is covered, while the other shoots, in a direction from the internal towards the external angle, along the inside of the lower eyelid, which also conceals it beneath its edge.

The body of the encanthis, or that middle portion of the whole excrescence, which reaches, from the caruncula lachrymalis and semilunar fold, inclusively, over the conjunctiva almost to the junction of the sclerotica with the cornea, sometimes forms a prominence, as large as a small nut, or chesnut. At other times, it is of considerable size, but depressed, and broken down, as it were, at its centre. Still, however, the body of the encanthis preserves that granulated appearance, which prevailed at first; while one, or both the appendages, on the inside of the eyelids, appear rather like a lippomatous, than a granulated substance.

On turning out the inside of the eyelids, these appendages, or elongations of the encanthis, form a prominence projecting forward. When both eyelids are equally affected, and turned inside out, the lippomatous appendages conjointly represent, as it were, a ring, the back of which rests on the globe of the eye.

Fabr. Hildanus was acquainted with this disease, which he treated with success, and named, *fungus scirrhus oculi canthum*. (Cent. 1. Obs. 2.)

However, in the case related by Hildanus, the encanthis seems only to have had one appendage, situated on the inner surface of the upper eyelid, below its edge.

Sometimes, as is noticed on the subject of the pterygium, the encanthis assumes a cancerous malignancy. This character is evinced by the dull red, and, as it were, leaden colour of the excrescence; by its exceeding hardness, and the lancinating pains, which occur in it, and extend to the forehead, the whole eye-ball, and the temple, especially, when the tumour has been slightly touched. It is, also, evinced by the propensity of the excrescence to bleed, by the partial ulcerations on its surface, which emit a fungous substance, and a thin, and exceedingly acrid dis-

charge. This malignant species, or rather this degenerated state of the encanthis, only admits of palliative treatment; unless, indeed, an effort be made to extirpate it entirely, together with the whole of what is contained in the orbit, and, even then, the event is very dubious.

The benign encanthis, how large soever it may be, is always curable by extirpation. Those instances, which are small, incipient, and granulated like a mulberry, or of a fringed structure, which originate either from the caruncula lachrymalis, or the semilunar fold of the conjunctiva, or from both these parts together, and even in part from the internal commissure of the eyelids, may be raised by means of a pair of forceps, and cut off from the whole of their origin, closely to their base, with the curved scissors with convex edges. In the performance of this operation, it is unnecessary to introduce a needle and thread through this little excrescence, as some are wont to do, for the purpose of raising it, and destroying more accurately all its origins, and adhesions. The same object is fulfilled by means of forceps, without inconveniencing the patient with a puncture of this kind, and drawing a thread through the part, in order to make a noose. However, in cutting out an encanthis of this small size, care should be taken not to remove, together with that portion of the excrescence which originates from the caruncula lachrymalis, any more of this latter body, than what is absolutely necessary for the precise eradication of the disease, in order that no irremediable weeping may be occasioned.

When the little excrescence has been detached from all its roots, says Scarpa, the eye must be washed several times with cold water in order to cleanse it from the blood, and then it is to be covered with a piece of fine linen, and a retentive bandage. On the 5th, 6th, or 7th day, the inflammation arising from the operation entirely ceases, and the suppuration from the wound is accompanied with the mucous appearance already described. The little wounds are then to be touched with a piece of alum, scraped to a point like a crayon, and the vitriolic collyrium, containing the mucilage of quince-seeds, is to be injected into the eye in question several times a day. If these means should not bring about the wished for cicatrization; but, on the contrary, the small wounds situated on the caruncula, and internal commissure of the eye-lids, should become stationary, and covered with proud-flesh, the argentum nitratum ought to be applied to them. The conjunctiva, however, should be avoided as much as

possible, especially, if at all wounded. When the fungous granulations have been destroyed, the cure may be perfected by the collyrium already mentioned, or rather by introducing, thrice a day, between the eye-ball and internal angle of the eye-lids, the powder of tutty, and the armenian bole. Bidloo extols very much powdered chalk, either alone, or in conjunction with burntalum. (*Exercit. Anat. Chir. Decad. 2.*)

Excision is equally applicable to the inveterate encanthis, which is of considerable size, and broken down at its body, or which forms a prominence, as large as a nut, or chesnut, with two lippomatous appendages extending along the inner surface of one, or both eye-lids. The application of a ligature to such an excrescence ought never to be regarded as a method of cure; for, the large, inveterate encanthis never has a sufficiently narrow neck to admit of being tied: On the contrary, when the tumour is voluminous, its roots, invariably, extend to the caruncula lachrymalis, the semilunar fold, and the conjunctiva covering the eye-ball, oftentimes, nearly as far as the cornea. In this state, also, the encanthis has one, or two lippomatous appendages, which reach along the membranous lining of one, or both eye-lids. Hence, though the ligature were to produce a separation of the body of the encanthis, one, or both the lippomatous appendages would still remain to be extirpated. This second operation could only be accomplished by the knife. In this disease, there is no foundation for the fear of hemorrhage, to which the advocates for the ligature attach so much importance; for, cases are recorded of considerable, inveterate encanthis being removed, without the least untoward occurrence from loss of blood. To these, Scarpa observes, he could add a great number of his own, so that no doubt can now be entertained on this point.

Pellier relates a case, in which an encanthis was followed by a dangerous hemorrhage, though it had been cut out by an expert oculist. He enters, however, into no detail concerning the nature of the complaint, nor the way, in which the operation was performed; circumstances from which one might deduce the reason of an unusual accident. Indeed, the same author adds, "I have often performed this operation for such excrescences, and have never met with a similar occurrence." (*Recueil d'Observ. sur les Maladies de l'Œil, Part. 2, Obs. 118.*)

In the above-mentioned case of a large, inveterate encanthis, with only one elongation on the inside of the upper eye-lid, as soon as Fabricius Hildanus had taken hold of the body of the tumour with a

hook, and drawn it towards him, he turned out the inside of the eye-lid, so that the lippomatous appendage was made to project through its whole extent. Then he dissected this production away by means of a small bistoury, and continuing the incision, he entirely detached the body of the encanthis from the conjunctiva covering the eye-ball, from the semilunar fold, and from the caruncula lachrymalis. The operation was followed by the most complete success, and ought to serve as a model, and guide, to all surgeons, who have occasion to treat this disease.

When the encanthis is large, and inveterate, with two large lippomatous elongations, one on the inside of the upper eye-lid, and the other on that of the lower one, we are to proceed in the following manner. The patient being seated, an assistant is to turn out the inside of the upper eye-lid, so as to make one of the appendages of the encanthis project outward. By means of a small bistoury, a deep incision is next to be made into the elongation, in the direction of the margin of the eye-lid; and then having taken hold of, and drawn it forwards with a pair of forceps, we are to separate it, throughout its whole length, from the inside of the upper eye-lid, proceeding from the external, towards the internal angle of the eye; as far as the body, or middle of the encanthis. We are then to do the same to the lippomatous appendage on the inside of the lower eye-lid. Afterwards the body of the encanthis is to be elevated, if possible, with a pair of forceps; but when this instrument will not answer the purpose, a double hook must be employed. This middle portion is now to be detached partly by the bistoury, and partly by the curved scissors from the subjacent conjunctiva, on the globe of the eye, from the semilunar fold, and from the caruncula lachrymalis; dividing the substance of this last part more, or less deeply, according to the depth and hardness of the large, inveterate encanthis. Here it is proper to state distinctly, that when we have to deal with an old, large tumour of this nature, that is deeply rooted in the caruncula lachrymalis, it is not regularly in our power to preserve a sufficient quantity of the substance of this part, to prevent the tears from dropping over the cheek, after the wound is healed.

The eye is to be repeatedly washed with cold water.

The rest of the treatment, consequent to the extirpation of a large encanthis, is almost the same as what was explained in speaking of the small incipient one. Bathing the eye very frequently in the lotion of mallows, and employing anodyne, de-

tergent collyria, are the best local means, until the mucous appearance, preceding suppuration, has taken place on the surface of the wound. Then we may have recourse to mild astringent ointments and collyria. The mildest topical applications are generally the best, both in the first stage of suppuration, as well as afterwards, particularly, when, together with the encanthis, we have removed a considerable piece of the conjunctiva, which covered the eye-ball towards the nose, and was intimately connected with the body of the excrescence.

The following case related by Marchetti, will throw additional light on the contents of this chapter. *Curavi quemdam canonicum Polonum laborantem meliceride magnitudinis jujubæ, quæ à carunculâ anguli majoris oculi ad totam pupillam porrigebatur. A multis tenuata curatio medicamentis, decoctis scilicet, collyriis, et aliis hujusmodi; omnia tamen octo mensium spatio incassum adhibita. Cùm verò me consulisset, ipsum tumorem evellendum censui; quod cùm reformidaret, spe tamen salutis operationem admisi, quam statim molitus sum, corpore priùs expurgato accuratissimè, ab aliis medicis. Paravi itaque hamulum, quo ipsam meliceridem perforavi, et manu apprehendi, alterâ verò forcipe eandem cum folliculo sectione separavi tum à carunculâ, à tum tunicâ adnatâ, et ipsâ pupillâ; atque ita totum tumorem eduxi sine ulnâ offensa ipsius oculi; à quibus statim applicui gossypium imbutum aquâ rosacâ cum ovi albumine agitâ et portunculâ croci, patiente tres dies hoc modo fasciâ victo; adhibito postmodum collyrio cum aquâ rosarum; et pulvere tutiæ præparatâ, quibus spatio octo dierum omnino convaluit æger; increpantelicè meam præceptore meo ab Aquapendente audaciam; cùm tamen brevi spatio temporis id præstiterim, quod alii medici non potuerunt perficere: idque presentibus præclarissimo Joanne Dominico Sala cum multis studiosis. (Obs. Med. Chir. Sylloge, obs. 21)*

The preceding account is taken from Scarpa sulle Malattie degli Occhi. I know of no better work, to which I can refer the reader. They who understand German, however, may peruse Richter's remarks on the subject, in his *Anfangsgr. der Wundarzn. Band. 2, p. 473, &c. Edit. 1802*. He is doubtless one of the best writers on the diseases of the eye in general.

ENCEPHALOCELE (from *εγκεφαλον* the brain and *κηλη* a tumour.) A hernia of the brain. (See *Hernia Cerebri*.)

ENCYSTED TUMOURS. (See *Tumours Encysted*.)

ENEMA. (from *ενημι*, to inject.) Aglyster. The following are some of the most useful glysters, employed in the practice of surgery.

Cathartic.

- g. Decocti Hordei ℥j.
Salis Muriatici ℥j.—Misce.
g. Decocti Avenæ ℥j.
Olei Olivæ ℥ij.
Magnesiæ vitriolatæ ℥j.—Misce.*

Anodyne.

- g. Mucilaginis Amyli, Aquæ distillatæ sing. ℥ij. Tincturæ Opii guttas XL.—Misce.
g. Olei Olivæ ℥iv. Tincturæ Opii guttas XL.—Misce.

The two latter glysters are particularly useful in cases in which there is great irritation about the rectum, bladder, or urethra. They have great effect in diminishing spasmodic affections of this canal and the neck of the bladder.

Tobacco,

Employed in cases of strangulated Hernia.

- g. Nicotianæ ℥j. Aq. ferventis ℥j. The plant is to be macerated ten minutes, and the liquor then strained for use. One half should be first injected, and soon afterwards the other, unless the glyster should operate with dangerous violence, as it sometimes does in particular constitutions.

ENTEROCELE. (from *εντερα*, the bowels, and *κηλη*, a tumour.) A species of hernia, in which the contents of the tumour are intestine.

ENTERO-EPIPOCELE. (from *εντερα*, the bowels, and *επιπλον*, the omentum, and *κηλη*, a tumour.) A species of hernia, in which the contents of the swelling are composed both of intestine and omentum.

ENTERO-HYDROCELE. (from *εντερα*, the bowels, and *υδρεκηλη*, a dropsy of the scrotum.) This must mean a common scrotal rupture, with a good deal of water, in the hernial sac; or else a *congenital hernia*, (in which the bowels descend into the tunica vaginalis testis,) attended with a collection of fluid in the cavity of this membrane.

ENTEROMPHALOS (from *εντερα*, the intestines, and *ομφαλος*, the navel.) A hernia at the navel, formed by a protrusion of intestine.

ENTERORAPHE. (from *εντερα*, the in-

[*A glysterequally efficacious and always at hand may be prepared by mixing together, a table spoonful of olive oil, two of molasses, and one of common marine salt, with a pint of warm water.]

testines, and *εαφη*, a suture.) A suture of the intestines.

ENTEROSCHEOCELE. (from *εντερα*, the intestines, and *οσχεοκηλη* a hernia in the scrotum.) Such a case in which the protruded parts are intestine.

ENTROPIUM. (from *εν* and *τροπω*, to turn.) An inversion of the eye-lids. (See *Trichiasis*.)

EPIGLOTTIS SHOT AWAY. The practice of M. Larrey furnishes a curious example, in which the epiglottis of a French soldier was shot off at the battle of Alexandria, on the 21st, of March, 1801. The ball entered at the angle of the jaw, crossed the throat obliquely, and came out at the opposite side of the neck. The base of the tongue was grazed, and the epiglottis shot away; the patient spit it up after the accident, and shewed it to the surgeon, who first saw him. One will be convinced of the fact by an account of the symptoms.

The patient was not in much pain; but his voice was hoarse, feeble, and scarcely audible.

When he first attempted to swallow, he was seized with a convulsive suffocating cough, attended with vomiting. Annoyed by thirst, which the extreme heat of the weather and the irritation of the wound excited, he incessantly repeated the attempts to drink; but, always with the same result. Four days were passed in this deplorable condition. He already experienced violent complaints at his stomach; continual loss of sleep; he had a small accelerated pulse; and was beginning to look thin.

Such was the state of this wounded soldier, when M. Larrey saw him on the fifth day. After making a few enquiries about what had passed after the accident, attempting to make the patient drink, and examining the interior of the mouth. M. Larrey was convinced, that the paroxysms of suffocation, and the inability to swallow depended upon the permanent opening of the glottis, the lid of which had been shot away. The prognosis of the injury was exceedingly unfavourable, and there can be no doubt, that, if the patient had been abandoned to the resources of nature, he would have died in the course of a few days. The indications were equally difficult to fulfil: the most urgent was to appease the hunger and thirst, with which this poor soldier was afflicted. M. Larrey, very fortunately, was provided with an elastic gum tube, constructed for the œsophagus. This instrument was introduced with the usual precautions, into the pharynx, and by means of it, the patient was given some drink, which relieved him much,

and afterwards some rich broth. The patient was fed in this manner for six weeks, at the end of which time, he was able, without the assistance of the tube, to swallow thick panado, and thickened rice, made into little balls. The powers of speech and deglutition in time became much more perfect; in consequence, as M. Larrey imagines, of an enlargement of the arytenoid cartilages, and an expansion of that part of the base of the tongue which lies next to the glottis, having formed a sort of substitute for the epiglottis. (See *Larrey's Mémoires de Chirurgie Militaire*, Tom. 2, p. 145—149.)

The foregoing case illustrates, in a convincing manner, the importance and utility of elastic-gum tubes for conveying nourishment and medicines down the œsophagus in wounds about the throat. All practitioners, and, especially, military surgeons, should be duly impressed with the necessity of having such an instrument always at hand. The patient, whose case is above recited, owed his preservation altogether to this means, without which he must have been starved to death.

EPIPHORA. (from *επιφερα*, to carry with force.) By this term is meant an accumulation of tears on the anterior part of the eye: in consequence of which, the person afflicted is not only under the necessity of frequently wiping them away, but vision is injured by the morbid refraction, which they produce in the rays of light that enter the pupil. The disease may arise from a more copious secretion of tears than the puncta lachrymalia can absorb, or, as is most common, from an obstruction in the lachrymal canal, in consequence of which the tears are prevented from passing freely from the eye into the nose. *Ware on the Epiphora, or Watery Eye.* (See *Fistula Lachrymalis*.)

EPIPOCELE (from *επιπλοον*, the omentum, and *κηλη*, a tumour.) A hernia, formed by a protrusion of a piece of the omentum. (See *Hernia*.)

EPIPLOMPHALON. (from *επιπλοον* the omentum, and *ομφαλος*, the navel.) An omental hernia, protruding at the navel.

EPIPLOSCHEOCELE. (from *επιπλοον*, the omentum, *οσχεον*, the scrotum, and *κηλη*, a tumour.) An epiplocele, or omental hernia in the scrotum.

EPISTHOTONOS. (from *επεσθω*, forwards, and *τεινω*, to extend.) A spasm, by which the body is drawn forwards.

EPULIS. (from *επι*, upon, and *ελαω*, the gums.) A small tubercle on the gums. It is said sometimes to become cancerous.

The best plan of cure is to extirpate it with a knife.

EPULOTICS. (from *επυλω*, to cicatrize.) Applications conducive to the healing of wounds.

ERETHISMUS. (from *ερεθίζω*, to irritate.) Any thing which causes irritation. Mr. Pearson has described a state of the constitution, produced by mercury, acting on it as a poison. He calls it the *mercurial erethismus*, and mentions, that it is characterized by great depression of strength, anxiety about the præcordia, irregular action of the heart, frequent sighing, trembling, a small, quick, sometimes intermitting pulse, occasional vomiting, a pale contracted countenance, a sense of coldness; but the tongue is seldom furred, nor are the vital and natural functions much disturbed. In this state, any sudden exertion will sometimes prove fatal. Mr. Pearson advises, with a view of preventing the dangerous tendency of this affection, the immediate discontinuance of the use of mercury; and exposing the patient to a dry cool air. The incipient erethismus may often be averted by the camphor mixture with large doses of the volatile alkali, if mercury be also left off. Sarsaparilla is also beneficial, when the stomach will bear it. (*Pearson on Lues Venerea*, page 156, &c. Edit. 2.)

EROSION. (from *erodo*, to know off.) *Erosio*. This word is very often used by surgical authors in the same sense as ulceration; viz. the formation of a breach, or chasm, in the substance of parts, by the action of the absorbents.

ERYSIPELAS. (from *ερῶω*, to draw, and *πᾶλας*, adjoining.) St. Anthony's fire; so called, from its tendency to draw the neighbouring parts into the same state, or, in other words, from its propensity to spread.

Erysipelas may be defined to be an inflammatory, cutaneous, and trivially elevated swelling, that is attended with redness, which disappears, and leaves a white spot for a short time after being touched with the end of the finger, and the affection is characterized by a remarkable propensity to spread with rapidity to a large extent.

In this definition, we have adopted the opinion of medical and surgical writers, who have generally agreed to arrange erysipelas in the class of inflammatory complaints. However, though the affection may have such relations with the latter disorders, as will not allow it to be considered as a positively separate species of disease, yet, if its symptoms be investigated with care, it will be found, that these relations are sufficiently remote to

make erysipelas and phlegmon be regarded as two very distinct kinds of inflammation. It has been thought, that the principal difference, existing between the two affections, consisted in the situation which was peculiar to each; erysipelas commonly affecting the surface of the skin, which is very irritable, while phlegmon is situated more deeply in the very substance of parts. It will presently be seen, that this explanation is not sufficient to account for the very different symptoms, which belong to the two affections.

It is observed in the *Parisian Chirurgic Journal*, that the history of Erysipelas becomes an important consideration, when we reflect, that the disease is extremely common, and that its treatment by many practitioners is purely prejudice and empirical.

The Greeks admitting in their theories of medicines the metaphysical principles of philosophy, and the superstitious ideas of the Pythagoreans, respecting numbers, agreed in the existence of four elements, four radical qualities, four temperaments, and consequently four humours and four species of tumours, produced by stagnation, or a diseased alteration of the humours above-mentioned.

Phlegmon, according to their theory, was formed by the blood, erysipelas by the bilious, œdema by the pituitous, and scirrhus by the melancholic or atrabillious temperament. But as this theory was often contradicted by observation, they were obliged to have recourse to the supposition of a mixture of the humours, by means of which tumours of a mixed description were formed; whence, no doubt, we derive the distinction of simple or true erysipelas, (produced merely by extravasation and deposit of the bilious humour under the skin;) from the compound or spurious, which took its name from the humour at the time most prevalent; hence the names of phlegmonous, œdematous, scirrhus, erysipelas, &c.

Such is Galen's idea of this disease, and which has been repeated by almost all subsequent authors who have written on the subject of tumours. The celebrated La Motte, who criticised this theory in different parts of his work, did not dare to ridicule it openly.

Erysipelas, in general, is an inflammatory superficial swelling, not circumscribed, accompanied with lively heat and pungent pain. The whole extent of the part affected is of a bright red colour, clear and shining. This appearance subsides on pressing the part with the finger, and returns when the pressure is taken off. These characteristic marks agree with all the different sorts of erysipelas, but are

variously marked, according to the different species.

The first, and most simple, is that mentioned by Sauvages in his Nosology, and Cullen in his First Lines, under the term of Erythema, from a word employed by Hippocrates in his Aphorisms, and in his *Coacæ Prænotiones et Epidemicæ*, to signify all the different species of erysipelatous affections.

But this word is not in general use, nor has it by any means a determinate signification: it appeared to Desault, that the general name of *bilious erysipelas*, employed by many authors, would be more eligible.

In this kind of erysipelas, the swelling is trifling, and often insensible, the skin of a rose-colour, generally a little verging towards yellow. The sensation, that the patient experiences, is neither tension nor pulsation, but a painful smarting, similar to what results from the application of hot water, or from exposure to the rays of the sun.

Towards the period of the invasion of this disease, and often many days before, the appetite is lost, the mouth is bitter, the tongue moist, and covered with a yellow mucus. Nausea and sometimes bilious vomitings come on. The patient becomes weak and dejected, and is affected with wandering pains and considerable heat, without any particular dryness of the skin or violent sense of thirst. Sometimes the disease begins with fever, more or less violent, preceded by shivering and violent pain in the head.

In the *phlegmonous erysipelas*, the skin is more raised than in the preceding species, the swelling harder and deeper, and of a deeper colour. There is generally a slight degree of tension of the integuments, with pungent pain, and at intervals pulsatory. On the first days of the attack of this disease, there is neither bitterness in the mouth nor nausea, the skin and tongue become dry, and are accompanied with a violent sense of thirst; the pulse is full and hard, indicating plethora.

At the expiration of a few days, particularly when the disease has been treated by bleeding and an antiphlogistic regimen, the tongue becomes foul and moist at its edges, bitterness of the mouth and nausea supervene, and the disease, in its progress, offers nothing to distinguish it from bilious erysipelas.

All the different kinds of erysipelas, says Desault, may be classed under these two heads, and we may judge from the state of the *primæ viæ* under what class they should be arranged. There is, however, a species of erysipelas different from the rest, that requires local treatment, though the symptoms are by no means ex-

traordinary. The species we allude to is consequent to wounds, contusions, &c.

The danger of every species of erysipelas is proportioned to its extent, to its intensity, and to the part affected; but the most dangerous of all is that which affects the head and the adjacent parts. This remark has been repeated, after Galen, by Ætius, Paulus Eginetus, Oribasius, &c. These authors are even apprehensive, that, in such cases, suffocation may take place, from an obstruction in the respiratory passages.

Hippocrates has formed an unfavourable prognostic of the erysipelas which disappears suddenly from the surface of the body, to affect the internal parts. (*Desault's Parisian Chirurgical Journal*, Vol. 2, p. 24—28.)

The following is a description of erysipelas, as it sometimes appears when it attacks the head.

The attack often takes place in a sudden manner, either with or without fever; but it is also frequently preceded by shiverings, complaints about the region of the heart, and other symptoms very similar to those which indicate the approach of an intermittent fever. The heat is often accompanied with a little delirium, and almost always with drowsiness of a more or less evident kind. A swelling afterwards makes its appearance, attacking the forehead, the cheeks, the nose, or eye-lids. This swelling is elastic and smooth; but it is not distinctly circumscribed, and it gradually spreads over such parts of the face as were not at first affected. The skin of the part affected becomes of a bright red colour, occasionally having a tendency to a livid hue, in other instances having a mixture of yellow. These colours disappear when pressure is made on the part affected, but very soon reappear when such pressure is discontinued. The patient experiences a burning heat, and a disagreeable pricking in the part, rather than any acute pain: sometimes he complains of a very troublesome itching. The surface of the tumour is shining, and, as it were semi-transparent but without hardness, tension, or any sensation of throbbing. The eye-lids are often so swollen that the patient cannot see, and the whole countenance is exceedingly disfigured. Small vesicles arise over a more or less extensive part of the erysipelatous tumour, and they are filled with a transparent serous fluid, and bear a great resemblance to those which are occasioned by boiling water. When such vesicles burst, the fluid which is discharged, sometimes excoriates the neighbouring parts. Very frequently, there is even a slight ulceration at the base of

these vesicles, which ulceration, in the worst sort of cases, assumes a gangrenous appearance, and falls rapidly into a state of complete mortification. When the disease takes a favourable course, the fever, which till now has continued, begins to abate; the vesicles dry up; and, at the end of an interval of eight or twelve days, the cuticle peels off. The degree of danger depends materially on the delirium and other symptoms indicating an affection of the brain.

The seat of erysipelas seems to be under the cuticle, in the rete mucosum; but it is not confined to this part, as the cellular membrane is always affected even in a considerable degree. The affection of this membrane, however, is very different from what happens in phlegmonous inflammation. In a genuine case of erysipelas, healthy pus is very rarely found enclosed in a circumscribed cavity; and when there is any secretion of purulent matter, a feel is communicated, on compressing the part, almost like that which a sponge would give. In such cases, the cellular substance has suffered considerably, and the part is frequently attacked by gangrene.

It is not easy to determine the causes which give rise to this complaint. There are a great many which, in conjunction with concomitant circumstances, manifestly contribute, in many cases, to the production of the disorder. Such are in particular:

1. Violent passions, such as anger, acute grief, &c.
2. Exposure to the heat of the sun, or that of the fire, too long continued.
3. The impression of cold damp air.
4. The action of various vegetable, mineral, and animal poisons.
5. Wounds, contusions, fractures, &c.

There is no doubt, that erysipelas is, for the most part, intimately dependent on the state of the constitution. Persons in the habit of drunkenness, and other kinds of intemperance, and who, in a state of intoxication, meet with local injuries, often have erysipelatos inflammation in consequence of them. Other subjects, who lead more regular lives, experience, when they meet with similar injuries, healthy phlegmonous inflammation.

The opinion of Hippocrates and Galen, with respect to the origin of this disorder from a congestion of the bile, is universally known to all initiated in the profession of surgery. This old doctrine has been, in some measure, revived by Tissot, and many other believers in the humoral pathology, who attribute the cause of erysipelas to an acrid humour, commonly a bilious one, diffused through the mass of

the blood. But, much as I despise the absurdity of this theory, observation obliges me to confess, that the complaint seems frequently to be connected with a wrong state of the chylopoietic viscera, and, probably, with a morbid state of the bilious secretion in particular. A sudden suppression of perspiration, by exposure to cold and damp, or other more obscure causes, is set down by every writer on the subject, as frequently having a great share in exciting, and keeping up, erysipelatos affections.

A further proof, that erysipelas is mostly dependent on constitutional causes, is that the affection most frequently happens in autumn, or in any season, when hot weather is succeeded by cold and wet.

After what has been said, the characters, which distinguish erysipelas from phlegmon, may be taken notice of.

1. The inflammatory swelling, which takes place in the former, is not so elevated as in the latter, and is never plainly circumscribed.

2. In most cases, the surface of the skin seems as if it were burnt.

3. The redness, though of a bright description, disappears on pressure.

4. The sense of throbbing, and darting pain, attendant on phlegmon, is not observable.

5. The inflamed part is free from tension, and appears as if it were affected with œdema, or rather with emphysema; only one can perceive no crepitation.

As we have already remarked, however, it must not be inferred from these differences, that erysipelas is to be considered as a disease essentially distinct from those, which are called inflammatory, as it has some characters in which it manifestly approaches them. Like phlegmonous inflammations, it may be excited by any local irritation. Like other inflammations, it may end in suppuration, though of a less perfect sort, than that in which phlegmon ends, and rarely contained in a circumscribed cavity. The pulse, in this disease, as well as in others of the same class, is frequent, hard, sometimes full; and when the patients are bled, their blood has the same appearance, and is covered with the same kind of inflammatory crust, as blood taken away in other kinds of inflammation.

It is proper, however, to notice, that practitioners are not universally agreed with respect to the nature of the pulse in erysipelas: it is, according to some, particularly Mr. Pearson, soft, frequent, and often irregular. But, if due attention be paid, this difference will be found to depend on particular circumstances. In the *phlegmonous* erysipelas, the pulse will al

ways be fuller, than in the bilious. In the impure air of hospitals, and in all places, where the air is impregnated with carbonic acid gas, and other noxious gases, we find, that various affections decidedly inflammatory, especially those which are attendant on wounds, affect the body, and the sanguiferous system in particular, in a very different manner from what is observed when the patients are living in a more salubrious air. All inflammations assume a character more or less unfavourable, in consequence of the influence of bad air. This is particularly striking in cases of erysipelas. In such instances, living in an impure atmosphere has a singular effect in augmenting the sense of weakness and dejection, which patients always experience in a certain degree, and, in these cases, it may even go so far as to produce a total alteration of the state of the pulse. But, if attention be paid to the disease in a situation where the atmosphere is not impregnated with putrid effluvia, it will be found to put on a very different shape. The symptoms of dejection, of nervous irritation, and of the brain being affected, are much less conspicuous; and the state of the pulse, especially in patients who have not been previously debilitated by other diseases, bears a great resemblance to that which takes place in an inflammation of the chest.

We have also to remark, that, beside bad air, many other circumstances, which do not even belong to the nature of erysipelas, may have a share in producing an alteration of its symptoms. Thus, while inflammations of another kind, such as pleurisy and acute rheumatism, particularly affect robust persons, in whom the vital principle exists with a great deal of energy, erysipelas is prone to attack persons who are aged, or of delicate and depraved constitutions. The latter is also seen making its appearance as a symptom, in weakened parts, which have in a certain degree been deprived of their tone, as is the case with *œdematous* parts. It is not surprising, that, in these different cases, in which the tone of the system has already suffered, the state of the pulse, in persons affected with erysipelas, should seem different from what it is in individuals, who are more healthy and robust.

I confess, that I prefer the division of erysipelas into the *phlegmonous*, *bilious*, and *local*, from wounds, &c. as adopted by Desault. By some other writers, the disease has been distinguished into the *acute erysipelas*, the *œdematous erysipelas*, and the *malignant* or *gangrenous erysipelas*. These three species, which are strictly only different degrees of one same disease, or varieties produced by the particular circum-

stances, in which the patient is placed, may be either symptomatic, or idiopathic.

The *acute erysipelas* is mostly met with in persons of a sanguineous and choleric temperament; it makes its attack suddenly, and is very apt to affect the face. The pulse is always frequent, and most commonly full and hard. All the other general symptoms of inflammation are observable. These subside a little when the erysipelas has completely formed, though they often increase during the first periods of the swelling. The heat of the part affected is very great; the skin is of a brighter red colour than it is in the other kinds of erysipelas; vesicles form on the surface of the swelling, but they are less numerous, and more distinct, than those originating in the other species of this complaint. In the acute erysipelas, the inflammation is seldom followed by suppuration, except just at the edges of the eyelids, and the disease speedily terminates, sometimes in three or four days. The part affected changes its colour, and becomes yellowish; and the cuticle separates in small scales. The whole scalp is often affected with a painful sensibility, which even continues a long while after the disease is entirely at an end.

The acute erysipelas is often idiopathic. It is sometimes observed to attack the same person periodically, at certain times of the year. It is also very frequently a consequence of wounds, &c.

The attack of the *œdematous erysipelas* is neither so sudden, nor so violent, as that of the preceding kind. The swelling increases more gradually; it spreads to a greater extent; the heat is less ardent; the inflammatory symptoms are less evident; the pulse is not so hard, and the strength is more depressed. The symptoms of the brain being affected are more alarming. The colour of the skin is, in this case, much deeper, and intermingled with yellow and brown; the vesicles are small and numerous; and when the part affected has been exposed a few days to the air, it becomes covered with a brown dark-coloured scab, which somewhat resembles the one which occurs in the confluent small-pox.

This sort of erysipelas is far more uncommon than the foregoing one, and is much more dangerous. The patients often are in a state of delirium, or rather of lethargy, on the seventh, ninth, or eleventh day, or sometimes a little later. It is chiefly in hospitals that the disorder occurs, often appearing there to be epidemic, though it cannot be said to be ever contagious. It is particularly prone to attack persons weakened by age or intemperance, children, and dropsical subjects. When

the œdematous erysipelas makes its appearance, as a symptom of some other affection, it is not nearly so dangerous as when idiopathic. It is always, however, to be considered as a serious malady, whatever may be its occasional cause. It is more apt, than the acute erysipelas, to shift its situation from the surface of the body to the internal parts. It is also seen affecting one leg, and then the other, several times in the course of one indisposition. When the brain becomes affected in this manner, delirium, and other most alarming symptoms, are immediately excited.

The *gangrenous erysipelas* bears a considerable resemblance to the preceding kind, in regard to the symptoms, with which it makes its attack; but it is much more rapid in its progress. The swelling soon becomes covered with phlyctenæ, the basis of which is livid; and symptoms of gangrene, attended with a state of the pulse, similar to that which takes place in malignant fevers, are not long before they make their appearance. This species of erysipelas is very liable to occur on the face, shoulders, and chest. The danger, which attends it, is proportioned to the more or less vigorous state of the system: the case is often fatal, particularly when the disease attacks persons who have been already debilitated by other causes. When it terminates favourably, small cavities and sinuses are often found in the cellular substance, which contain pus of a bad quality. In this sort of case, one or more ulcers form externally, through which considerable sloughs of the cellular membrane are discharged.

When erysipelas in the legs terminates favourably, it generally leaves those parts more or less affected with an œdematous swelling, which it is often very difficult to cure.

TREATMENT OF ERYSIPELAS.

The treatment of erysipelas, as it is remarked in the *Parisian Chirurgical Journal*, has varied materially at the different periods of the medical art. Celsus recommended bleeding indiscriminately in every species when the strength would permit. *Ætius*, who founded his opinion on the authority of Galen, never employed the lancet, except in cases of manifest plethora: the bilious erysipelas he treated with purgatives. *Paulus Æginetus*, on the contrary, never exhibited them, but when, from some obstacle, he was prevented from ordering bleeding; a practice, which, like Galen, he recommended as a general precept. *Oribasius* recommends medicines proper for the evacuation of the bile.

Avicenna, in adopting this last method, observes, that bleeding is rarely useful, sometimes hurtful; and, yet, at the same time, admits, that there are cases, in which it is indispensable. *Actuarius* has made nearly the same remarks as *Avicenna*, and, also, extends the use of purgatives to every species of inflammation. *Guy de Chauliac*, *Thévenin*, *Munnick*, *Sydenham*, &c. prescribe bleeding in all species of erysipelas, unless the affection is extremely slight. In this opinion they are followed by a crowd of moderns, some of whom, influenced by the inspection of the blood when it presents what they term a plethoric or inflammatory crust, order the bleeding to be repeated three or four times.

Thévenin sometimes prescribed a gentle emetic, but not till after other means had been unsuccessfully tried.

Paré has remarked, that the disease generally terminates by vomitings and bilious dejections; but at that time the emetic tartar was not in use; a medicine admirably calculated to accelerate this termination: and now, though the effects of this remedy are known, yet many practitioners are afraid to employ it. *Stoll* himself never prescribed it, without the patient being previously prepared.

Richter, the celebrated professor of *Göttingen*, and one of the most judicious German authors, recommends the exhibition of an emetic on the first attack of a bilious erysipelas. He admits that there are cases, though extremely rare, which require bleeding in the first instance.

Cullen proposes cooling purgatives in addition to these means, and coincides with the method employed by *Sellé*, who, viewing erysipelas as a species of putrid fever, joins to evacuations the use of bark, wine, and other antiseptics.

Bell treats this mode of practice, and the opinion on which it is founded, as purely hypothetical. He prefers the antiphlogistic regimen and bleeding, but by no means local, as it is generally productive of ulcers difficult to cure. The ancients appeared to attribute much efficacy to bleeding and the use of purgatives, and even still more to topical applications. Some recommend the use of diaphoretics and sudorifics; whilst others, and indeed the greatest number, prescribe relaxing, refreshing, and diuretic, drinks.

Alexander of Tralles, after the doctrine of Galen, prescribed only cold water to his patients. He recommended them to breathe fresh air, and to be slightly clothed; and observes, with great judgment, that this is the plan that nature seems to point out, and supports the propriety of this method by cases peculiar to himself.

Paré also attributed some advantages to fresh air, to which he joined the use of cooling medicines, &c. Sydenham, with the same views, prescribes the use of small beer. Others recommend red wine and water. Thévenin treats obstinate erysipelatous affections by means of baths, whey, veal-broth, and cold mineral waters.

Topical applications have been for a long time in general use for the cure of erysipelas; nevertheless, Hippocrates, who speaks frequently of this disease, and who relates many cases of this description in his epidemics, says nothing to induce a suspicion, that he ever had recourse to local applications. The practice of modern physicians has differed materially; they have been diffuse in the use of liniments, fomentations, poultices, and even ointments of every description. It was soon remarked, that oils, ointments, plasters, and all fatty substances, were pernicious in the treatment of erysipelas. Galen made this remark; which, however, did not prevent the use of the emp. diapalma dissolved in oil of roses. Fabricius Hildanus has seen the use of the oil of roses, continued for some days, produce gangrene, in a case of phlegmonous erysipelas. Munnick quotes this case, and Manget reports it at length. The medicaments of a benumbing and narcotic quality, recommended by Galen, Paulus Eginetus, and many others, have also tended to produce mortification.

Resolvents and repellents have been generally recommended. Authors, however, agree, that their application is not unattended with danger: for, independently of the fatal consequences not uncommonly apprehended from metastasis, it was objected, that induration or gangrene of the part affected might often be occasioned by their indiscriminate use. A conviction of the truth of this remark induced Paulus Eginetus to reject astringent and spirituous applications, and Avicenna to prefer the effusion of cold water on the part to more active applications. For the same reason, oxycrate, a boasted remedy among the Greeks, was preferred to weak solutions of lead, as recommended by Thévenin, and the different infusions of elder-flowers, melilot, and other similar plants, were even in more general use.

De Haen employed a decoction of elder-flowers in whey; sometimes emollients, as warm water, marshmallow-water, water of frogs spawn, &c.

Hartman attributes the most serious symptoms, and even mortification of the part itself to this last application. Celus used cataplasms covered with compresses, moistened with cold water. Ga-

len rendered them resolute by the addition of oxycrate. Paulus Eginetus recommended a poultice of barley-meal; Thévenin one made of rye boiled in lime-water; and Diembroeck one composed of bean-meal and oak-leaves reduced to a powder. But it is superfluous to dwell longer on methods which have proved inefficacious, and which have been long since abandoned.

Cullen, concurring in opinion with all accurate observers on the inutility and danger of every topical application, absolutely rejects them. He allows, however, the part affected to be sprinkled with powdered starch, (a practice of late years adopted in England,) to absorb, according to Mr. B. Bell, the acrid humour, which is furnished, and which tends to produce ulceration.

Without doubt, chalk has been employed by some practitioners to answer the same indications. (*V. J. Munnick, Chir. lib. i. Manget. Bibl.*)

B. Bell, who perfectly accords with Cullen, with respect to the injurious effects of local applications, yet permits a thin layer of the extract of Saturn to be applied to the part by means of a feather, when the pain is very acute.

Richter, so far from approving this practice, views the extract of Saturn in the same light as other astringents, which he observes, often produce fatal consequences. This learned professor, like Sellé, Stoll, and other skilful practitioners, makes use of no application whatever to the part. Actuarius observes, also, that local applications are useless in erysipelas, and that the inflammation will subside by the use of cathartics alone.

Besides the means, which we have pointed out, there was one mentioned by Thévenin, which, during his time, was in very general use: this was the application of blisters. He proposed them with the view of evacuating, or at least diverting, the erysipelatous humour, when they were applied at a considerable distance from the part affected,

This recalls to our recollection a case mentioned by Alix, in his *Observata Chirurgica*, fasc. iii. where blisters were applied to the legs of a peasant, for a wandering and obstinate erysipelas, which had successively occupied the back, the thorax, and the face. The erysipelas attacked the feet, and was immediately followed with gangrene.

Such is the abridged history of what has been written on the subject of erysipelas. The means related for the cure of the disease may perhaps appear in some degree tedious; but they are more important to recollect, than theoretical

distinctions of the various species of erysipelas.

Desault may be regarded as having adopted the most judicious and successful mode of treating erysipelas. The following was the practice, which he pursued in the Hôtel Dieu.

In the *bilious* erysipelas, whatever degree of heat or fever may exist, he gives, in the first instance, a grain of emetic tartar dissolved in a considerable quantity of fluid; the symptoms generally diminish as soon as the effects of the medicine have ceased. He has seen them entirely subside, although the medicine produced no other sensible alteration, in the animal economy, than an increase in the secretions of the insensible perspiration and urine: sometimes the symptoms resisted these evacuations, and he was obliged to have recourse once or twice, or even more frequently, to the use of the emetic-drink. When the erysipelas is cured, and the bitterness in the mouth and fever have subsided, two or three purges of cassia and manna, with a grain of emetic-tartar, are exhibited: during the process of the cure, the patient is ordered to drink freely of a diluting ptisan, acidulated with oxymel: as soon as the symptoms are mitigated, the diet of the patient is allowed to be made more nourishing and generous; for, when it is too rigidly observed, the bilious erysipelas is apt to be produced, particularly in hospitals, where the air, generally speaking, is unhealthy.

The bilious erysipelas, however considerable its extent, and whatever part it may occupy, yields in a few days, to the plan here laid down; and, in the end, Desault always succeeded in the cure; nor did he recollect an instance of its return. He invariably observed, that the cases of the patients, who had been bled previously to their admission into the hospital, were more serious and obstinate, particularly, when it had been frequently repeated.

The same practice is not applicable to the *phlegmonous* species of erysipelas. In this kind, emetics and other evacuants augment the irritation and tension, already considerable, nor should they be had recourse to till the plethora and irritation of the patient are diminished by one or more bleedings, according to the urgency of the symptoms and the strength of the patient. The bilious erysipelas, which then appears, points out the necessity of evacuations, and the proper time for their exhibition. During the whole treatment, the patient takes nothing but a diluting drink, such as whey,

or a simple decoction of dog's tooth with oxymel.

When erysipelas arose from an internal cause, Desault did not employ any topical application whatever, in either species, but left the part, as much as possible, exposed to the air.

But when either bilious or phlegmonous erysipelas is consequent to a contusion, wound, or an ulcer, regimen and internal medicines, according to Desault, are insufficient, unless topical applications are employed to abate the local irritation, and to excite suppuration; with this view, cataplasms have been employed, and their good effects, he says, have been remarked in a great variety of cases: but he deems this caution essential, viz. that the application of the poultice should not extend much below the contused surface, or the edges of the wound. If any application is permitted to lay on the rest of the erysipelatous surface, according to Desault, it should be aqueous and weak, such as the *aq. veg. min.* in common use, made in the proportion of ʒj. of the extract of Saturn to a pint of water, (See *Desault's Parisian Chirurg. Jour. Vol. 2.*)

For my own part, I have always been in the habit of applying Goulard's Lotion to erysipelatous cases arising from wounds, and other kinds of local irritation, and I have had every reason to think such applications as beneficial in these affections as in phlegmon.

Mr. Pearson prefers mild warm cataplasms, composed of the powders of aniseed, fennel, camomile flowers, &c. mixed with a fourth part, or an equal quantity, of bread, and a proper quantity of milk. Linseed powder, he says, may sometimes prove a convenient addition.

Such writers, as have divided erysipelas into the *acute*, *dematous*, and *gangrenous*, adopt the following modes of practice.

The first indication in the treatment of the acute erysipelas, is to lessen the inflammation by bleeding, which is to be repeated, more or less, according to symptoms. Such other means are also to be adopted, as tend to diminish the force of the circulation. In short, the antiphlogistic plan, in the full sense of the expression, is proper.

In general, it is unnecessary to repeat bleeding, in any case of erysipelas, so frequently as is done in other inflammatory cases. We ought to be guided, however, in this respect, by the state of the pulse, and other symptoms, never forgetting the patient's age, the degree of strength before the disease, and the situation of the disorder itself. *Cæteris paribus*, the pa-

tient will bear bleeding better in the country, and in an open, pure air, than in a large city, and especially in an hospital.

The circulation, in the vessels on the surface of the body, should also be promoted by diluting beverages, proper doses of nitre, the saline mixture, and, above all, by administering small doses of the antimonial powder, or tartar emetic. The belly should be kept open by glysters, and mild laxatives, and, when the patient is very much inconvenienced by the irritation and excessive heat of the part affected, small doses of opium may occasionally be given.

A gentle emetic very often has an exceedingly good effect in calming the fever, and expediting the cure of the erysipelas, especially after bleeding has been practised. But emetics are not to be continued, when they have a purgative effect.

In this complaint, as in every other one, in which the head is affected, the patient should be made to keep his head, as much as possible, in an elevated position.

In the œdematous erysipelas, perhaps, bleeding is never admissible. The loss of even a very small quantity of blood may have the most fatal consequences. One should also be exceedingly sparing of other evacuations. A determination to the skin should in particular be kept up by antimonials, and irritation and pain soothed by administering the *spiritus ætheris vitriolici compositus*, æther, camphor, opium, &c.

When the disorder seems to shift its situation to any internal part, and, particularly, to the brain, blisters should be applied between the shoulders, to the head or legs, without the least delay.

In order to prevent the complaint from terminating in mortification, the patient's strength should be supported by tonic remedies, such as wine and bark.

With regard to the treatment of the gangrenous erysipelas, nothing more need to be said than what is contained in the article on mortification.

Consult *Desault's Parisian Chirurgical Journal*, Vol. 2. Also *Œuvres Chirurgicales de Desault par Bichat*, Tom. 2, p. 581, &c. *Encyclopédie Méthodique*, Partie Chirurgicale, art. *Erysipèle*. Cullen's *First Lines of the Practice of Physic*, Vol. 1. *Pearson's Principles of Surgery*. *Some Parts of Hunter's Treatise on the Blood, Inflammation*, &c. *Richerand's Nosographie Chirurgicale*, Tom. 1, p. 118, &c. edit. 2. *Lassus, Pathologie Chirurgicale*, Tom. 1, p. 8, &c. edit. 1809.

ERYTHEMA. (from *ερυθρος*, red.) A redness of any part. For the erythema mercuriale, see *Mercury*.

ESCHAR. (from *εσχαρω*, to form a

scab, or crust.) This term is applied to a dry crust, formed by a portion of the solids deprived of life. When any living part has been burnt by the actual, or potential, cautery, all that has been submitted to the action of this application, loses its sensibility and vital principle, becomes hard, rough on the surface, and of a black, or grey, colour, forming what is properly named an *eschar*. This, in short, is only a slough, produced by caustics, or actual fire.

ESCHAROTICS. (from *εσχαρω*, to form a crust over.) Applications, which form an eschar, or deaden the surface on which they are put. By escharotics, however, surgeons commonly understand the milder kind of caustics, such as the *hydrargyrus nitratus ruber*, *serigo aris*, &c.

EXÆRESIS. (from *ἐξαίρειν*, to remove.) One of the divisions of surgery adopted by the old surgeons; the term implies the removal of parts.

EXCISION. (from *excindo*, to cut off.) The cutting off any part.

EXCORIATION. (from *excorio*, to take off the skin.) A separation of the cuticle; a soreness, merely affecting the surface of the skin.

EXCRESCENCE. (from *excreasco*, to grow from.) A tumour, growing out of, or from any part, and not included in its substance.

EXFOLIATION. (from *exfolio*, to cast the leaf.) The separation of a dead piece of bone from the living is termed, *exfoliation*.

One part of a bone is never separated from another by the rotting of the dead part, for that which comes away is as sound as it ever was. Exfoliation takes place soonest in bones, which have the fewest cells, and whose texture is the closest. Before any part of a bone can be thrown off, by exfoliation, it must be dead. But, even then, till the process of exfoliation begins, the bone adheres as strongly as ever, and would remain for years, before it could be separated by putrefaction alone. Bones are composed of two substances, viz. a true animal matter, and an earthy one, which are only intermixed with each other. A dead bone acts, on the system, in the same manner, as any other extraneous body. It stimulates the adjacent living parts; in consequence of which, such a process is begun, as must terminate in its being thrown off. The effects of this stimulus are, first, that the living adjacent bone becomes more vascular; a circumstance, which always takes place, when a part has more to do, than is just sufficient for the support of life. Secondly, that the earth of

the living part, where it is in contact with the dead bone, is absorbed; hence, the bone becomes softer, and adheres by its animal matter only. Thirdly, that the living animal part is at last absorbed along the surface of contact: this part of the process commences long before the last is finished. Both of them begin, first at the surface, though in their course, they do not every where take place in an equal degree at the same time. Fourthly, in proportion to the waste, made by the last part of the process, a fungus arises from the living surface, and fills up the intermediate space, so that there is no vacuum. These different stages together constitute ulceration. When any part of a bone is once loose, it will be pushed to the surface in the same manner, as most other inanimate bodies would be, and this stage is partly mechanical, and partly a continuation of ulceration. A proof of the third stage, above-mentioned, may be derived from cases, in which people die, while exfoliation is going on. A small groove, or worm-eaten canal, can then be discovered, which becomes gradually deeper, and follows the irregularities of the living and dead surfaces. After the application of the trepan, a circular piece of bone is frequently thrown off, which is always less than the space from which it came. This, however, would never be the case, were there not a loss of substance. (*John Hunter.*)

It was anciently believed, that whenever a bone was denuded, the exposed surface must necessarily exfoliate, and, this being taken for granted, the old surgeons used to set about bringing on an exfoliation as quickly as possible. For this purpose, the actual cautery was usually applied to the part of the bone, which was uncovered, and, as under such treatment, a portion of the bone was of course killed, and then exfoliated, the prejudiced practitioner believed, that he had only accelerated a process, which must of necessity have followed in a slow and tedious manner.

Mr. Hunter very truly remarks, that neither caustics, nor the actual cautery, hasten exfoliation; they only produce death in a part of the bone, which is the first step towards exfoliation. If caustics ever hasten exfoliation, when the bone is already dead, it must be by producing inflammation in the adjacent living bone this brings about a change in it, and makes it exert a power, which it was incapable of before.

Exfoliation is not a necessary consequence of a bone being laid bare, and deprived of its periosteum. If the bone be in other respects uninjured, healthy, and

enjoying a vigorous circulation of blood through its texture, granulations will be generated on the surface of such bone, which will cover and firmly adhere to it, without the smallest exfoliation being thrown off; especially, in young subjects. But, if caustic, stimulating, or drying applications be made use of, the circulation in the surface of the bone will necessarily be disturbed and destroyed, and that part of the surface, through which the circulation ceases to be carried on, will be separated, and cast off, by the process of exfoliation.

If any application to an exfoliating portion of bone be at all efficacious, it must be one, which will stop the mortification in the affected bone, and promote the absorption of those particles of bone, which form the connexion between that which is living and that which is actually dead. And as the bone dies from the same causes, as the soft parts mortify, we should at least follow the same principles in practice, which we do in the latter instance, and, though from the inferior vascularity and vital powers of the bones, we cannot expect surgery to have so much control over their affections, as over those of the soft parts, yet, every good will be obtained, which it is possible to acquire. Attention to such principles will at least teach us to avoid making the death of part of a bone more extensive, than it would be, if the cautery, caustics, and strong astringents, were not employed.

The best mode of attempting to prevent an exfoliation from occurring at all on a bone, that has been exposed by a wound, is, to cover the part again, as soon as possible, with the flesh, which has been detached. This, as we shall notice in the article *Head, Injuries of*, may generally be practised with advantage, when the scalp has been detached from the cranium, provided the flap is still connected with the rest of the integuments.

When the exposed bone cannot be covered, it should be dressed with the mildest and simplest applications, with plain lint, or lint spread with the unguentum spermatis ceti.

The dead pieces of bone, when very tedious in exfoliating, when wedged in the substance of the surrounding living bone, and when so situated as to admit of being safely sawn, or cut away, may be removed in this manner, as is described in the articles *Caries* and *Necrosis*. In such operations, Mr. Hey's saws are eminently advantageous.

In speaking of necrosis, we shall have occasion to notice the efficacy, which Mr. Crowther has found blisters possess in

quickening the cure of necrosis, when kept open by the savin cerate, as recommended in his work on the white swelling.

EXFOLIATIVUM. (from *exfolio*, to shed the leaf.) A raspatory, or instrument for scraping exfoliating portions of bone.

EXOMPHALOS. (from *ἐξ*, out of, and *ομφαλος*, the navel.) A hernia, protruding at the navel.

EXOPHTHALMIA. (from *ἐξ*, out, and *ὀφθαλμος*, the eye.)

In the case, to which the most judicious surgical writers apply the terms, *exophthalmia*, *ophthalmoptosis*, *ptosis bulbi oculi*, the eyeball is of its natural size, and free from disease; it merely changes its situation, and partly or completely protrudes from the orbit. It is only confusing the subject to consider, as specimens of this disease, the cases, in which the globe of the eye is affected with enlargement, and on that account projects from the orbit in a preternatural degree, as happens in hydrophthalmia, staphyloma, and cancerous diseases of the eye. When the globe of the eye is pushed entirely out of the orbit, it generally lies upon the temple, or cheek, and vision is totally destroyed. There are instances, however, in which a considerable degree of sight has been recovered, notwithstanding the exophthalmia was most complete, and had lasted several years. (*Hope in Phil. Transactions, for 1744, Richter's Bibl. 4 Band. p. 343.*)

There are three descriptions of causes, which may occasion exophthalmia.

1. The first and least common is a violent concussion of the head. A man fell from a height of about fifteen or sixteen feet, and pitched upon his head. The right eye was forced out of its socket, and hung over the cheek. The patient was deprived of his senses immediately after the accident, and became affected with coma. There was a contusion over the right parietal bone; but, no fracture. The eye spontaneously resumed its natural position, a short time after the accident, and, in the course of a month, with the assistance of low diet, and repeated bleeding, the cure was completed. (*Mém. de l'Acad. de Chirurgie, Tom. 1, p. 198, 4to.*) It has been alleged, that the eye has been forced out of the orbit in a violent fit of sneezing. But, such cases, says Richter, are very uncommon, and always imply a considerable relaxation of those parts, which serve to retain the eye in its socket, or some other predisposing causes, to which attention should be paid in the treatment. (*Richter's Anfangsgründe der Wundarz. Band 3, p. 407, edit. 1795.*)

2. A far more frequent cause of exophthalmia is a thrust in the eye with an instrument, which is narrow enough to pass between the orbit and the eyeball, so as to push the latter out of its place.

A stick, a tobacco pipe, (*White's Cases in Surgery, p. 131.*) a foil, &c. may cause the accident. Repeated experience proves, says Richter, that in such cases, however forcibly the optic nerve and muscles of the eye may be stretched; however much the interior parts of the organ may be injured on the occasion; and, though the dislocated eye be generally deprived of the faculty of seeing, yet, when the organ is replaced as speedily as possible, it not only recovers its natural motion, but also its original power of vision. (*See Scultet. Appendix, Obs. 69, Covillard, Obs. 27. Borel, Centur. 3, Obs. 64. Rhodius, Centur. 1, Obs. 84, White's Cases, p. 131.*) But, before we reduce the eye, Richter advises us always to examine the instrument, which was pushed into the orbit; as, when it is brittle, a fragment of it is exceedingly apt to remain behind in the socket, and will require to be extracted by means of the finger, or a probe. When the weapon is pointed and hard, it sometimes pierces the bones of the orbit, and enters the brain, nose, or antrum. In the first case, which is often difficult to ascertain immediately, though after a time it is generally rendered plain enough by the symptoms induced, the consequences are mostly fatal. In the two other cases, although the danger is not pressing, yet the surgeon should be very attentive, in the event of suppuration, to procure and maintain a ready outlet for the matter.

There is generally little difficulty in replacing the eye. Frequently it returns of itself into its natural situation again, as soon as any trivial obstacles to its reduction are removed; and in other instances, it easily admits of being put into proper place with the hand. The indication, says Richter, is always accomplished with more facility, the sooner it is attempted. When the protrusion has existed several days, and the eye and other parts in the orbit are already inflamed, Richter recommends us to endeavour to diminish the inflammation by general antiphlogistic means, and external emollient applications, before we try to replace the eye, and afterwards attempt to effect the reduction of this organ in a gradual manner. When the optic nerve, and one or more of the muscles of the eye, are torn, no hope can be entertained, that the eyesight and motion of the organ will ever be regained. But, this degree of injury, as Richter observes, cannot always be immediately detected,

because the optic nerve and muscles are concealed by the conjunctiva; and, if the nature of the case were known, still it would be advisable to replace the eyeball, and endeavour to prevent the disfigurement, which its loss would unavoidably produce. But, says Richter, it is necessary, especially if the parts behind the eyeball have suffered severely, to use such means, as will ensure a ready escape for the matter, which may possibly form. The injury of the conjunctiva, muscles, and nerve, may be so violent, adds this experienced writer, that the practitioner may find it most prudent not to reduce the part, until after suppuration has taken place. Richter thinks, that a surgeon may the more readily make up his mind to this conduct, as many cases have proved, that the eyeball, even after being dislocated from the orbit a long while, has been easily replaced. The parts, which connect the eye with the orbit, may in other cases be so torn and injured, that it may be most advisable to extirpate the organ. Richter maintains, however, that this should never be done, when there is the least chance of saving the eye. If the bones in the orbit should be fractured, the reduction must not be made until the indications, which this complication presents, have been fulfilled.

When, says Richter, the instrument, with which the eye has been pushed out of its socket, is blunt and thick, like a finger, a stick, a foil, &c. the eyeball itself always sustains a violent contusion, which brings on vehement inflammation, and lessens or destroys all hope, that, after the reduction, the eyesight will be restored. Sometimes, in these cases, an extravasation of blood in the orbit occurs, the iris is lacerated, the cornea burst, and a part of the humours of the eye discharged. Although, under such circumstances, it is scarcely to be expected, that the eye-sight can be recovered, yet it is proper to reduce the eye, because should the organ be destroyed by suppuration, or the loss of its humours, the deformity may be obviated by an artificial eye, which is not the case, when the eye has been cut away. It is also to be considered, that the mischief often seems to be worse, than it really is, and the eye-sight is sometimes regained contrarily to all expectation.

After the reduction of the eye, the first care of the surgeon should be to prevent and diminish inflammation. In some cases, the inflammation is slight; while, in others, especially, when the eyeball has been severely struck, it is extremely violent. All the usual antiphlogistic means, both general and topical, are to

be employed, and, of the latter, Richter says, astringents are the best, as the inflammation arises from the contusion and stretching which the parts have suffered. The possible consequences of the inflammation, such as suppuration, opacity of the cornea, &c. are to be treated according to the rules laid down in other parts of this dictionary. (See particularly *Cornea*, *Opacity of*; *Hypopium*; *Ophthalmia*.) In general, the sight is restored in proportion as the inflammation is diminished. Should this not happen, after the ophthalmia has been entirely removed, the surgeon must try what effect such remedies, as stimulate the nerves, will have upon the optic nerve. An account of the most eligible medicines, for this purpose, will be found in the article *Amaurosis*.

3. The third cause of exophthalmia is a preternatural tumour in the orbit. The swelling, as it enlarges, gradually pushes the eyeball out of its socket. The tumours, which may be formed in the orbit, are of several kinds. The principal, however, are encysted swellings, which may contain either an aqueous fluid, a pappy substance, or a thick matter. Sometimes, the cellular substance in the orbit is affected with induration and swelling, so as to force the eye partly or completely out of this cavity. An abscess in the orbit has also been known to make the eyeball protrude. (*Pellier*.) Exostoses in the orbit have had the same effect. In some cases, in consequence of suppuration in the antrum, the lower part of the orbit has been raised, and the eye forced out of its place. Fungous diseases of the antrum are very liable to occasion such mischief. (See *Parisian Chirurgical Journal*, Vol. 1, p. 104, &c.) In all these examples, the eyeball is displaced from the orbit gradually, and vision is at length impeded. Instances, however, are on record, where the sight was never lost, though the eye was protruded for years. (See *Richter's Chirurg. Bibliothek*. 4. Band, 2. Stuck. p. 243. *White's Cases in Surgery*, p. 135.)

Experience proves, also, that after the reduction, the motion of the eye, and power of seeing have been regained, in cases, where the eye has been gradually pushed out of the orbit, and been displaced a considerable time, even as long as several years, during all which period vision was lost. (*Acrell*; *Brocklesby in Med. Obs. and Enquiries*. Vol. 4. In order to reduce the eye into its natural position, it is necessary to remove the cause, by which its protrusion is occasioned. Suppuration and fungous tumours in the antrum must be treated according to directions laid down in the article, *Antrum*

After the cure of such diseases, the antrum is often reduced to its natural dimensions, and, in this circumstance, the orbit may become so wide, that the eyeball will return into it again. Should this not happen, the extirpation of the organ will be proper. The induration and swelling of the cellular substance in the orbit may be sometimes dispersed by means of mercury. (See *Louis, sur Plusieurs Maladies du Globe de l'Œil, in Mém. de l'Acad. Royale de Chirurgie, Tom 13. Edit. 12mo.*) When such treatment fails, we are recommended to extirpate the eye. (*Richter's Anfangsgr. der Wundarzneykunst, Band 3, p. 413.*) Exostoses, which are situated in the anterior part of the orbit may sometimes be removed. The continental surgeons generally advise us to expose the tumour by an incision, and to apply caustic, or the actual cautery to it, in order to kill the protuberant part of the bone, and make it exfoliate. In this country, most practitioners would prefer the employment of cutting instruments for removing such exostoses. When, however, the tumour lies deeply in the orbit, it cannot be got at, and, if it should resist the effect of mercurial medicines and mezeoreon, we are directed to extirpate the eye. (*Richter, op. et loco cit.*) Abscesses in the orbit ought to be opened, and, after this has been done, the eye generally returns into its proper position. (*Pellier.*) Encysted tumours in the orbit seldom admit of being extirpated in the customary manner. Richter says, it is best to open them, press the contained matter out, and extract the cyst either immediately, or after a few days.

In a late publication, a memorable case of exophthalmia is related by Mr. Travers; the globe of the eye appears to have been gradually forced upwards and outwards, and to have had its motions considerably impeded, in consequence of the orbit being partly occupied by two swellings, which were of the nature of the aneurism by anastomosis.—(See *Aneurism.*) The swellings could not have been removed, without at the same time extirpating the eye. Mr. Travers was therefore induced to try, whether applying a ligature to the carotid artery would have the effect of checking and curing the disease; an expectation, which was warranted by analogous instances, in which the growth of swellings, and their dispersion, are brought about by lessening the quantity of blood determined to them. The experiment completely succeeded; the swellings in the vicinity of the eye subsided; the patient was freed from several grievous com-

plaints, to which she had been previously subject; and, amongst other benefits, a cure of the exophthalmia was one result, which most interests us in the present place. The case is also highly important on other accounts, and, more particularly, as confirming the fact, that the carotid artery may be tied, without any dangerous effects on the brain, and, as proving, that, in cases of aneurism, the surgeon should not be afraid of proceeding to such an operation. (See *Medico-Chirurgical Transactions, Vol. 2, Art. 1.*) As I have had occasion to disagree with Mr. Travers upon one or two points in other parts of this dictionary, I feel infinite pleasure in taking this opportunity of applauding the judgment and decision, with which he acted in the case, that we have cited.

When the causes of exophthalmia have been removed, the eye must be put into its natural situation. If the organ has been long displaced, the surgeon often finds the fulfilment of this indication attended with difficulty. Indeed, he is frequently obliged to employ methodical bandages for the purpose of promoting the gradual return of the eye into the orbit. Yet, even in such cases, the eyesight is often regained; but, if this should not happen spontaneously, stimulants and tonics ought to be tried. (See *Aneurism.*)

I shall conclude this article with referring to such authors, as present us with the most interesting cases and information on the preceding subject.

Fab. Hildan. centur. 6. obs. 1. Vander Wiel, centur. 2. obs. 9. Paw, obs. anat. 23. Tulpius, lib. 1, cap. 28. Hope, in Philosophical Trans. for 1744. M. Louis sur plusieurs maladies du Globe de l'Œil, &c. in Mém. de l'Acad. de Chirurgie, Tom. 13, in 12mo. Brocklesby, in Medical Obs. and Enquiries, Vol 4. p 371. White's cases in Surgery, p. 131—135, &c. Warner's cases in Surgery, p. 108. Edit. 4. Lassus, Pathologie Chirurgicale, Tom. 2, p. 144. Edit. 2. Richerand's Nosographie Chirurgicale, Tom. 2. p. 117. Edit. 2. Medico-Chirurgical Transactions, Vol. 2. art. 1. Richter's Anfangsgründe der Wundarzneykunst, Band. 3. p. 406, &c. Göttingen 1795. The matter in this last work forms the basis of the foregoing observations.

EXOSTOSIS. (from ἐξ, out, and ὅστος, a bone.) A bony excrescence, or tumour, growing out of some part of a bone.

If bones resemble the soft parts of the body in their structure, they must resemble them in their diseases, and a swelling may take place in bones, as well as other parts; but, there is a particular kind of

tumour, which forms on their surface, and which is denominated an *exostosis*.

The generality of writers, even the most modern, have admitted many diseases among exostoses, which ought to be considered in a very distinct light; I need only instance the *spina ventosa*.

There seem to me to be only three species of exostosis, exclusively of venereal nodes. The first is the true exostosis, or osseous tumour growing from the very substance of a bone. The second consists chiefly in a thickening, and induration of the periosteum. And the third kind of exostosis might be termed *fungous*. An instance of such a disease growing from the cavity of the antrum, is related by Mr. Abernethy, in the Medical and Chirurgical Transactions, and quoted in another part of the present Dictionary. (See *Antrum*.)

The bony swelling, in some cases, acquires such a hardness, that no remains of a fibrous structure can be distinguished, and it absolutely resembles ivory; in other cases, it is spongy; and, lastly, it may be composed of osseous and fleshy parts together.

The bones, most frequently affected with exostosis, are those of the cranium, the lower jaw, sternum, humerus, radius, ulna, bones of the carpus, the femur, and tibia. There is, however, no bone of the body, which may not become the seat of this disease. It is not uncommon to find the bones of the cranium affected with exostosis in their whole extent. The *ossa parietalia* sometimes become an inch thick. (*Boyer*.)

The exostosis, however, mostly rises from the surface of the bone, in the form of a hard round tumour, and venereal exostoses, or nodes, are observed to arise chiefly on compact bones, and such of these, as are only superficially covered with soft parts, as for instance, the bones of the cranium, and the front surface of the tibia.

The causes of exostoses do not seem to be at all understood. Most writers impute the disease to internal causes, such as scrofula and lues venerea. That the latter affection is the cause of nodes, which are certainly a species of exostosis, no one will deny; but, that scrofula is ever concerned in producing any of the other kinds of exostosis must not be admitted, at least, before some evidence is adduced in support of the doctrine.

The ease, with which bony tumours form in some persons, is certainly a very remarkable fact, and tends to render it probable, that constitutional causes have considerable influence. I remember, that Mr. Abernethy mentions, in his lectures,

his having seen a boy, who came out of Cornwall, who was so excessively afflicted with an apparent predisposition to exostoses, or an exuberant disposition of bony matter, that a very trifling blow would occasion a bony swelling on any bone of his body. His ligamentum nuchæ was ossified, and prevented the motion of his neck; the margins of his axillæ were also ossified, so that he was, as it were, completely pinioned. Besides all this, the subject in question, had numerous other exostoses on various parts of his body. Mr. Abernethy gave, in this case, the muriatic and acetic acids, with a view of dissolving the lime in the lad's system, which this gentleman thought might be too abundant, and not duly carried off in proportion to its secretion. The boy was also forbidden to eat food, containing any kind of lime.

An exostosis is always hard, but its size is various, and it may be indolent, or painful. By these signs, and its firm adhesion to the bone, it may be always distinguished from other tumours. Some exostoses cannot be ascertained before death. Such was the case in which the parietal bone was found, after death, to be three times thicker, than natural. Such also was the example, related in the memoirs of the Academy at Dijon, in which a person died from an exostosis on the internal side of the os pubis, which tumour prevented the discharge of the urine, or the introduction of a catheter, by its pressure on the neck of the bladder. (*Boyer*.)

Should an exostosis take place in the orbit, the eye would of course protrude preternaturally from this cavity, constituting a case of exophthalmia. Facts of this kind are to be met with on record.

Our ignorance of the pathology of exostoses, particularly their causes, accounts for the imperfection of our treatment of them. With the exception of the venereal exostosis, or node, there is no species of this affection, for which, it can be said, that we have any one medicine of the least efficacy.

Boyer, and other writers on the diseases of the bones, seem to regard some exostoses, as a perfectly inorganic mass of lime, and, consequently, they entertain no idea, that the absorbent vessels can possibly take away the particles of the tumour, just as the seerning arteries have laid them down. Such writers, however, were well aware, that nodes were capable of being diminished, and this could only be effected by the action of the absorbent system.

Whether any exostoses might be lessened by keeping open a blister, over such

tumours, for a considerable time, is a point, perhaps, worthy of further investigation. It is certain, that such applications tend to diminish venereal nodes, after they have been lessened as much as they can be by mercury; and we also know, that blisters, kept open, promote the absorption of the dead bone in cases of necrosis.

When exostoses merely occasion a deformity, and no pain, nor inconvenience, from the pressure, which they produce on the neighbouring parts, it is certainly most advisable not to undertake any operation for their removal; for, as Boyer has truly observed, in by far the greater number of instances, the local affection is much less to be dreaded, than the means used for removing it.

Caustics and the cautery have occasionally been applied to exostoses; but, they always do mischief. Boyer mentions an unfortunate woman, who had a caustic applied to an exostosis of the inside of the tibia; but which, instead of removing the tumour, caused a necrosis, of which she was not well two years afterwards.

When exostoses are productive of much pain and injure the health, and their situation admits of their being safely removed, with the aid of suitable saws, or even with that of a gouge and mallet; the operation may be undertaken. Many tumours of this kind, however, have bases so very extensive, and deep, that, when situated on the limbs, amputation becomes preferable to any attempt made to saw or cut away the exostoses, so as to preserve the members, on which they are situated.

In removing an exostosis, its base must be as freely exposed by the knife, as circumstances will allow, and to this part a small fine saw may be applied. It appears to me that in cutting away some exostoses, the flexible saw, described by Dr. Jeffray, of Glasgow, (see *Amputation*,) might be found useful. Mr. Hey's saws are now so well known to the profession, that I scarcely need recommend them to be remembered in the present cases.

EXTIRPATION. (from *extirpo*, to eradicate.) The complete removal, or destruction of any part, either by cutting-instruments, the action of caustics, or the application of a ligature.

EXTRACTION. (from *extraho*, to draw out.) The taking extraneous substances out of the body. Thus bullets and splinters are said to be *extracted* from wounds; stones from the urethra, or bladder.

Surgeons also sometimes apply the

term, *extraction*, to the removal of tumours out of cavities, as for instance, to the taking of cartilaginous tumours out of the joints; they seldom speak of extracting any diseased original part of the body; though, they do so in one example, viz. the cataract.

EXTRACTION OF THE CATARACT.
(See *Cataract*.)

EXTRAVASATION. (from *extra*, out of, and *vas*, a vessel.) A term, applied by surgeons to fluids, which are out of their proper vessels, or receptacles. Thus, when blood is effused on the surface, or in the ventricles of the brain, it is said, that there is an *extravasation*. (See *Head, Injuries of*.) When blood is poured from the vessels into the cavity of the peritoneum, in wounds of the abdomen, surgeons call this accident an *extravasation*, or when the contents of any of the intestines are effused in the same way. The urine is also said to be *extravasated*, when, in consequence of a wound, or of sloughing, or ulceration, it makes its way into the cellular substance, or among the abdominal viscera. When the bile spreads among the convolutions of the bowels, in wounds of the gall-bladder, this is a species of extravasation.

In wounds of the thorax, an extravasation of blood also frequently happens in the cavity of the pleura. Large quantities of blood are often extravasated in consequence of the vessels being ruptured by violent blows: in the scrotum, on the shoulder, and under the scalp, this effect is observed with particular frequency.

In the articles, *Head, Injuries of*, and *Thorax, Wounds of*: enough is said of extravasations of blood in the cranium, and in the cavity of the chest. Under the term *Abdomen*, much has likewise been explained relative to extravasations in that part of the body. I mentioned, however, my intention of giving in the present place a more detailed account of the valuable observations of M. Petit on this subject, and I now proceed to fulfil my promise.

Various kinds of fluids may be extravasated in the abdomen in cases of wounds, sloughing of the intestines, &c. Bile, chyle, urine, blood, feces, &c. may all possibly be effused under particular circumstances,—circumstances already pointed out in the article, *Abdomen*. Surgeons used formerly to suppose, that, whenever any fluid escaped from a vessel, or bowel, into the general cavity of the peritoneum, it always became extensively diffused amongst the convolutions of the intestines. This erroneous supposition seemed to be confirmed by facts, the most

open to observation, and completely exempt from the possibility of mistake. Practitioners saw, that the water of dropsies, the pus of abscesses, which had burst into the abdomen, as well as the chyle and feces, which had escaped through a wound, or other sort of breach of an intestine, were invariably and universally diffused amongst the folds of the mesentery and bowels after death.

M. Petit (the son) first questioned the accuracy of the foregoing opinion, in relation to living subjects. He suggested, that, as in the living body, the intestines were distended with feces, alimentary matter, and air, while they were also mutually acting against each other, and in a continual state of compression from the alternate contraction of the diaphragm and abdominal muscles, there might be a superior resistance made to the weight of the extravasated fluid, which weight has a tendency to produce a separation of the viscera from each other. Is it not possible, says M. Petit, that, as soon as the patient is dead, and as soon as the above kind of resistance is destroyed, the extravasated fluid may spread without difficulty. M. Petit contends, that the truth of the preceding suggestion cannot be doubted, when we consider, that certain cases of hernia get well, notwithstanding the bursting of the gangrenous part of the intestine, after its reduction into the abdomen. In such instances, indeed, the contents of the bowel appear to escape externally through the wound entirely in consequence of the resistance made to their diffusion amongst the convolutions of the intestines. It might be objected, however, that, in cases of hernia, since the bowel is almost always adherent to the edge of the abdominal ring, the issue of the intestinal matter through the wound is rather to be ascribed to the ease, with which this event may happen, than to any resistance made internally by the surrounding viscera. But, M. Petit cites several cases, which leave no doubt, that there is a vast resistance made to the passage of extravasated fluids amongst the convolutions of the bowels, and folds of the mesentery.

After death, my fluid, extravasated in the abdomen, may, by its mere gravity, become dispersed among the viscera, because the parts being without action, make no opposition. But, in the living state, all the abdominal viscera reciprocally act, upon each other, and forming in consequence of this mutual support, as it were, only one body, the resistance, which is made to any extravasated matter will always keep it from becoming so widely diffused as many have imagined.

As Mr. Travers seems not to have comprehended the true sense of this part of M. Petit's essay, and has published some criticisms, which cannot be fairly applied to this valuable writer, I shall take the present opportunity of doing justice to a much respected surgeon, who cannot now stand up for himself. M. Petit writes: "Après la mort, un fluide épanché dans le ventre, peut par son seul poids s'insinuer à son gré et se disperser entre les différentes parties, parce qu'étant sans action, elles n'opposent aucune résistance; mais pendant la vie tous les viscères du bas-ventre agissant mutuellement les uns contre les autres, et ne faisant pour ainsi dire qu'un même corps au moyen de cette action mutuelle, la résistance qu'ils opposent au fluide épanché, ne lui permettra jamais de se disperser de la manière dont on se l'est figuré." (*Mém. de l'Acad. de Chirurgie*, Tom. 13, p. 169, 170.) We see, that M. Petit is here speaking of the way, in which matter, already extravasated, is kept from being extensively diffused in the living subject, and is endeavouring to explain, how when the compression, which all the abdominal viscera sustain during life, from the action of the muscles and other causes, is put at an end to by death, the mere gravity of the fluid already extravasated, may cause it to spread, and, on opening the body, the appearances may induce an erroneous idea, that the fluid was thus widely diffused, before the patient's decease.

Petit's own words, with the short comment, which I have taken the liberty to annex, will clearly shew, first, that this writer has by no means involved himself in the glaring absurdities, imputed to him by Mr. Travers; and, secondly, that the following remarks of this last gentleman are totally inapplicable to M. Petit—"Granting the assumption of effusions after death, I would enquire," says Mr. Travers, "what is the nature of the action exerted by a dead intestine, and from what cause, or, in what degree, its proper action is superior to that of the surrounding parts? But, how stands the fact? I assert, that effusion from a wounded bowel meets with the same impediment in the dead as in the living body, the resistance being purely passive. If, therefore, effusion depends, as I am quite willing to admit, upon the action of the wounded vessel overcoming the opposed resistance, it follows, that it can never happen after death, because action has ceased, whilst resistance remains the same." (*Travers on Injuries of the Intestines, &c.* p. 15, 16)

If Petit had alleged, that extravasa-

tion took place after death, from the action of a vessel, bowel, &c. his assertion would have been a fair mark for criticism; but, he neither says, nor means any thing of the kind: he simply explains, that matter, already extravasated before death, afterwards becomes more diffused by its own gravity, and the cessation of all active resistance to this occurrence in the dead body.

With respect to Mr. Travers's assertion, "*that effusion from a wounded bowel meets with the same impediment in the dead, as in the living body, the resistance being purely passive,*" I am sorry I cannot find reason to coincide with this unqualified declaration. By what perversion of language and common sense, can the resistance, made by the action of the diaphragm and abdominal muscles upon the viscera in a living body, be called *passive*? And would the cessation of this action, and the consequent removal of the pressure from the viscera in the living subject, were such things possible, make no difference, in regard to the facility, with which the contents of the bowels might be effused. If Mr. Travers means to ascribe the whole of the resistance to effusion to the pressure of the external air, a cause which other writers have not overlooked, (see *Abdomen*) he may be more correct in the use of the term *passive*; but, his notions of the real state of things will be far too circumscribed.

I shall next follow M. Petit in the inferences, which he has drawn from the reciprocal pressure or action of the abdominal viscera upon each other.

The first consequence is, that an extravasated fluid can only spread in the cavity of the abdomen, in the same way, that a fluid becomes effused in an external part; that is to say, the extravasation can only spread gradually and successively into such places as offer the least resistance. Blood, when it insinuates itself into the interstices of the muscles can only get from one membranous cell into another, by the first one being so distended, that the fluid can more readily get into a second cell, and, from this into a third, than increase the distended state of its first situation. Just so, in the abdomen, the blood, which escapes from a wounded vessel, is first effused into a situation near the opening in the vessel, either between the peritoneum and surface of the intestines, or, more deeply, amongst the convolutions of the bowels, or some of the folds of the mesentery. In proportion as the bleeding continues, the blood forces its original boundary, and dilates the place, which it occupied, in every direction, until it meets with less resistance in

making its way, either upward, or downward, or to the right or left. The extravasation continues to dilate the new space, which it fills in the same way, until either the first limits are forced, or the effused fluid spreads in another direction. In this manner, the extravasation will spread, till the resistance, made by the viscera, becomes equal to the impetus, with which the blood issues from the vessel. M. Petit was of opinion, that it was this kind of resistance, which put a stop to the hemorrhage, even before any coagulum had been formed in the opening of the vessel. That the blood, while flowing from the vessel and in a fluid state, should only make one mass, and be contained in one cavity, till coagulation takes place, is a circumstance, which cannot rationally be imputed to any thing else, but the resistance depending upon the mutual action of the viscera in the living state. It is also equally certain, that, it is in consequence of the sudden cessation of such resistance, that extravasated blood, which is fluid after death, becomes diffused among the different convolutions of the bowels, and forms numerous scattered collections.

The second inference, which M. Petit mentions, as deducible from the resistance arising from the reciprocal pressure of the abdominal viscera, is, that an extravasation in the cavity of the abdomen cannot so easily happen, as many have fancied. It was once not an uncommon idea, that a breach in a very moderate vessel would occasion a considerable extravasation, because the orifice could not be compressed, like that of a vessel in a more external situation. It is indeed true, that no compression can be directly applied to the opening of an internal vessel; but, the resistance, which the surrounding viscera make to the extravasation, operates as a substitute. M. Petit even thought, that, when blood was effused in the abdomen, it had a greater resistance to overcome, than when extravasated in an external part. According to this author, the resistance of the cellular membrane, the common bond of connexion between the muscles, is undoubtedly less, than that, which depends upon the reciprocal action of the intestines, and rest of the viscera. The incessant alternate motion of the abdomen and thorax, is in favour of the preceding opinion. The facility, also, with which, abscesses situated in the abdomen, are discharged, through a small, and, very frequently, not a depending opening, is an additional fact, proving, that the abdominal viscera, by the manner, in which they mutually press upon each other,

make a greater resistance to an extravasation, than can be made by the cellular substance in other parts of the body.

Swords have often been thrust completely through the body, without giving rise to any very dangerous symptoms, or only to such, as frequently attend wounds, which do not reach into the cavity of the belly. We cannot imagine, contrary to all probability, that, in this case, the weapon has slipped over the viscera, through their interstices, and, by good luck, has wounded none of the blood vessels. We must rather conclude, that an extravasation does not always ensue from a wound of the bowels, or blood vessels, or, at least, that the extravasation is not invariably attended with such consequences as former practitioners used to suppose.

For the purpose of rendering the foregoing remarks more intelligible, let us follow M. Petit in his observations, and take notice of the principle, which he has laid down in his excellent memoir; viz. that, without a particular action in the muscular fibres of the intestine, or artery, no extravasation would occur in the abdomen, even were there a breach in such bowel, or vessel. Supposing the blood vessels destitute of action, and the place of the opening pressed upon by a force equal to that, which operates upon the rest of their extent, the fluid, which they contain, would never be effused in the abdomen, so as to form an extravasation. Besides the obvious nature of this fact, M. Petit mentions his having actually seen it exemplified in the body of a man, who died of gangrene in the abdomen, in consequence of a hernia, which had been, for upwards of a fortnight, attended with the most violent symptoms of strangulation. Nearly the whole of the intestinal canal was equally affected with gangrenous mischief, so that it was scarcely possible to handle any of the bowels, without producing a breach in them. However, although the intestines were filled with very fluid excrement, none of it was extravasated in the abdomen. In several places, indeed, Petit found numerous little breaches of continuity, which had allowed a small portion of the excrement to escape; but only just enough to tinge the adjacent parts. Petit acknowledges, at the same time, that, round where these holes were situated, some slight adhesions had taken place between the bowels, and these and other parts; but he contends, that these were so weak, and easily broken, that they must have been incapable of hindering an extravasation. Petit concludes, that, in this instance, no extravasation hap-

pened, because the intestinal canal was everywhere affected with gangrene in nearly the same degree, and the disease had destroyed the tone and action of the muscular fibres of the intestines.

It is contended by Petit, that the foregoing case affords sufficient proof, that, without a contractile power in the blood-vessels and intestines, no extravasation of their contents could be produced in the abdomen, and that such an event would be opposed by the action of the abdominal muscles and diaphragm, which make uniform and equal pressure upon all the viscera. If this statement be correct, it is obvious, first, that the greater the action of the wounded vessels is, in relation to the quantity of fluid, which they have to propel, the greater will be an extravasation from them. Secondly; that no extravasation can arise, unless the action of the vessels themselves be capable of overcoming the resistance depending upon the mutual action of the parts. Hence, only wounds of vessels above a certain size can give rise to extravasations, at least, to any of importance. The veins cannot occasion so much extravasation as the arteries: nor are wounds of the intestines so liable to be followed by an effusion of the chyle and feces, as similar injuries of the blood-vessels are apt to be attended with an extravasation of blood. Petit was also of opinion, that wounds of the stomach were not, so often as those of the bowels, the cause of this kind of accident.

The feces cannot be so easily extravasated as blood, not only because the action of the intestines, particularly that of the small ones, upon their contents is weaker, than that of the arteries upon the blood, but, principally, because, when there is a breach in one of the bowels, the contents will continue their course through the intestinal canal, without any need of there being any considerable obstacle to the occurrence of an effusion. Petit admonishes us, however, not to conclude from what has been said, that the chyle and feces can never be extravasated in the abdomen. There is no doubt whatever, he observes, that an extravasation may take place, when the wound in the bowel is of ample size, the gut filled with chyle, or excrement, and care is not taken to empty the large intestines very often by means of clysters. The event may also happen, when pain and irritation render the muscular action of the intestines violent, and when unequal pressure is made upon the abdomen. Under such circumstances says M. Petit, the resistance, made to an extravasation, by the reciprocal action of the viscera is overcome, and the contents of the bowels

will continue to be effused, until the impulse arising from the contraction of these organs returns to a state of equilibrium, with the resistance depending upon the mutual action of all the viscera.

The extravasation of chyle and feces, does not take place differently from that of blood; but, in wounds of the bowels, there is this advantage, that the same opening, which has given passage to the extravasated fluid, may also allow it to return and pass off. According to Petit, we need no further proof of this, than the great evacuations of blood, which some wounded persons have had with their stools, without being afflicted with any of the symptoms of an extravasation. It is highly improbable, that such bleeding could depend upon the injury of any of the vessels ramifying upon the intestinal canal, since their size is too inconspicuous. In these cases, Petit was inclined to believe, that some vessels, either of the mesentery, or another part, were wounded together with the intestine, and that the blood insinuated itself into, and took its course, through the bowels, in consequence of the resistance made to its extravasation amongst the viscera.

The foregoing observations tend to prove, not only that an extravasation of intestinal matter cannot so easily happen in the abdomen as has been imagined; but, also, that it is less dangerous, than an effusion of blood usually is, and that it is accompanied with less violent symptoms. When the contents of the bowels are extravasated, adhesions are likewise observed to be more readily formed, and to limit the effused matter sooner than when the extravasation consists of blood. After such adhesions have once been formed, Petit conceived it to be probable, that the extravasation may be dispersed in the same favourable manner, as certain abscesses, which have discharged themselves into the intestinal canal. Blood, however, can never return into the vessel, from which it has escaped, since a clot shuts up the opening. But, a wound of an intestine remains continually open, till it is closed by the adhesions, which the bowel contracts to the adjacent parts: adhesion, indeed, is the only means, by which a wound of this description can be healed.

Amongst the numerous facts, says M. Petit, which might be adduced in proof of the difficulty which a wound of the stomach permits the aliment to be extravasated, the operation of an emetic, in such a case, is a striking one. Petit expresses his belief, that vomiting does not depend upon the action of the muscular

fibres of the stomach; but, entirely upon the sudden and violent contraction of the abdominal muscles. This author conceives, that if the particular action of the stomach itself had much concern in the production of vomiting, an extravasation of the alimentary matter would necessarily happen in the abdomen, when that viscus was wounded. However, in the instances, referred to by Petit, the occurrence did not take place, because, notwithstanding the violence, with which the abdominal muscles and diaphragm contracted, they made equal and uniform pressure upon all sides of the stomach. The danger of an extravasation is also less, inasmuch as a wound of the stomach is always much smaller, in relation to its cavity, than that of a bowel, in regard to the capacity of the intestinal canal.

Circumstances are very different in respect to wounds of the gall and urinary bladders, especially, when these receptacles are full. An extravasation is then an inevitable consequence, both on account of the great fluidity of the bile, and urine, and the contractile power, with which the parts are endued, and, against which, the action of the abdominal muscles makes no sort of resistance. An extravasation of these fluids is highly dangerous, by reason of their irritating quality with respect to the viscera. The colics and irregular contractions, which these stimulating fluids excite, also tend to make the extravasation become more widely diffused. The ease likewise, with which the bile and urine mix with the serum, that naturally moistens the surfaces of all the viscera, leads us to suspect, that, whenever such fluids are extravasated, they very soon become universally dispersed amongst all the convolutions of the intestines.

Against these latter extravasations, says Petit, little can be done, and, unless they are in small quantity, and their increase can be prevented, the patient's life hardly admits of being saved. Leaving a catheter in the bladder, indeed, is a sure means of hindering the extravasation of urine from increasing; but, not much confidence can be placed in the kind of outlet afforded by the duct of the gall-bladder. In the article *Gunshot-Wounds*, I shall have occasion to notice the proper treatment of wounds of the bladder, as well as the success, with which such injuries were treated by that eminent military surgeon M. Larrey.

When the extravasated matter is completely encysted and circumscribed, it happens, that, as such matter had to overcome the resistance of the parts, before it could be effused, no sooner is a passage

afforded for its escape, than the reaction of the separated parts necessarily forces out whatever fluid lies between them. This is a third consequence, which is pointed out by Petit, as resulting from the resistance, made by the reciprocal action of the abdominal viscera to extravasations.

The foregoing remarks tend to prove, that an extravasation in the abdomen, and, especially one of blood, may be as completely discharged, as a collection of fluid in the thorax. The evacuation, at least, may always be easily effected, when the extravasation is bounded on any side by the parietes of the abdomen: a circumstance, which must invariably occur, whenever the extravasation is considerable. Indeed, Petit adds, that it was always the case, as far as his experience went, even when the effusion was not very copious. It is not enough to make surgeons understand, that fluids, extravasated in the abdomen admit of being discharged by an operation; it is also proper to explain the symptoms, denoting the cases, in which such a proceeding should be adopted.

In order to establish the signs, whereby we may be certainly assured, that a wound, penetrating into the abdomen, has been followed by extravasation, we must begin, says Petit, by distinguishing the subsequent symptoms from those which immediately accompany the wound, and which are, properly speaking, the true symptoms, because they are essentially owing to the division of the parts affected. The first consequences of this division, are pain, irritation, tension, convulsion, strangulation, and inflammation of the abdomen, the natural sources of the other succeeding symptoms, and which vary according to the situation of the wounded parts that are inflamed, and according to the degree of inflammation. Such are the hiccough, vomiting, costiveness, the suppression or retention of the bile and urine, a violent fever, which generally happens at the beginning, and when the inflammation is arrived to a certain degree, the concentration of the pulse, which is so low as scarcely to be perceived, faintings, cold sweats. These are the effects of the primary symptoms, which we observe every day in wounds of the abdomen.

When the succours of art are seasonably applied, we not only get the better of these symptoms, and stop their progress, but often entirely prevent them. Let us suppose therefore, that by proper management, the primary symptoms have been so far remedied, that, in four, six, eight, or ten days after the wound,

they are entirely dissipated, or at least much abated: if, continues Mr. Petit, after an intermission of so many days, more or less, the same symptoms return, or with greater violence, without any apparent cause, we may confidently affirm, that these secondary or subsequent symptoms are owing to an extravasation.

One can scarcely be induced to believe at first, that there should be any secondary symptoms of the extravasation of blood; for, since the extravasation commences from the very moment of the wound, why do not these symptoms commence from that instant? And why do they not increase, in proportion as the blood diffuses itself in a larger quantity?

Petit has referred the reason to the following circumstances: blood extravasated in the abdomen, does not give rise to any particular complaints, either by the pressure, which it makes, or by its quality; and, whenever any symptoms are occasioned on the first occurrence of the effusion, they are those of weakness, depending upon the loss of blood to the circulation. The extravasation afterwards becomes entirely circumscribed by the adhesions, produced by the surrounding inflammation. An additional quantity of fluid continues to be secreted from the vessels into the encysted cavity of the effused blood, and, consequently, pain, inflammation, &c. are occasioned by the increased distention now brought on. I do not, however, deem Petit's theory of this subject of much importance; perhaps, it is inaccurate; but, the fact itself, that the symptoms of an extravasation in the abdomen are consecutive, is a piece of information highly interesting to the practitioner.

The foregoing observations are only an abstract of Petit's excellent memoir, which well merits to be attentively perused by every man, who follows the profession of surgery: it is, indeed, one of the most valuable of the essays published by the French Academy of Surgery. (See *Suite de l'Essai sur les Epanchemens par feu M. Petit le fils; in Mem. de l'Acad. de Chirurgie, Tom. 4. Edit. in 12mo.*)

Much of this subject is still more particularly considered in the article, *Abdomen*, to which the reader is referred.

EYE, CALCULUS IN THE INTERIOR OF. Scarpa has dissected an eye, which was almost entirely transformed into a stony substance. It was taken from the body of an old woman, and was not above half as large as the other sound one. The cornea appeared dusky, and, behind it, the iris, of a very singular shape, was dis-

tinguishable, being concave, and without any pupil in its centre. The rest of the eyeball, from the limits of the cornea backward, was unusually hard to the touch.

On making an incision, Scarpa found the sclerótica and choroides, almost in their natural state, and a small quantity of limpid fluid issued from the anterior chamber of the aqueous humour. Beneath the choroides, two hard calculous concave plates presented themselves, united together by means of a complete membranous substance. One was situated forward; the other backward; the latter occupied the bottom of the eye; the former the situation of the corpus ciliare and crystalline lens.

Scarpa made an incision, through the compact membrane, which joined together the margins of the two calculous bodies. He found in the cavity, instead of the vitreous humour, some drops of a glutinous bloody fluid, and, in the longitudinal direction of this cavity, a little soft cylinder, which, extending forward from the bottom of the eye, along the great axis of this organ, was inserted into a cartilaginous, elastic substance, situated in the centre of the front calculous body, precisely where, in the natural state, it is customary to find the lens, and its capsule, which were entirely wanting.

The posterior surface of the iris had formed a firm adhesion to the middle of the cartilaginous substance, situated in the centre of the front calculus. Hence, the iris, when beheld on the side next the cornea and anterior chamber appeared as it actually was, concave in the middle.

The optic nerve, which had degenerated into a mere thread, entered the sclerótica and choroides, as well as the centre, or bottom, of the posterior calculous body, and lost itself in the little soft cylinder, which, as was explained, proceeded to be inserted into the cartilaginous substance, situated in the middle of the anterior calculus, or the place naturally occupied by the lens, and its capsule. The greater part of this little cylinder, was, according to appearance, nothing else, than the membrane of the vitreous humour, destitute of fluid, shrivelled, and changed into a compact substance.

Haller met with a case similar to the foregoing one: "In furis cadavere, quod anno 1752 disseccimus, diritas quidem non tanta, raritas autem major fuit. Cum enim in eo homine nervos oculi sollicitè pararemus, cœcum fuisse eo latere, atque cicatricem in cornea esse, et duritatem in oculo ipso adparuit. Cum dissectione de-

functi essemus, adparuit mira mali causa. Choroidæ membranæ subertat, retinæ loco, lamina ossea, aut lapidea, (nam fibras osseas nullas vidimus) cui ipsa choroidæa adhærebat, ut alias retinæ solet concentrica, hemispherio cavo similis, nisi quod duplici lamina fieret, et in altero latere duobus quasi localis excavaretur. Is quasi scyphus accuratè rotundo foramine perforabatur, quâ nervus opticus subit, ut eò magis induratum retinam adpareret.

"Intra hanc osseam caveam nullum vitreum legitimum corpus, sed nervum, quasi albam, nempe cylindrum reperi-mus, quæ per foramen ossei cyathi transmissa metiens ejus diametrum, denique adhærebat osseo confuso corpori, quod potuisses pro corrupta lente crystallina habere. Ei corpori undique et iris, et processus ciliorum cognomines, connascebantur, et cornea denique ad quam iris pariter conferbuerat. Nunc sive retinam, ut ego persuadeor, sive quicquam aliud fuisse velis, quod in os cavum et hemisphæricum mutatum sit, in oculo tamen teneberrima parte corporis indurationem perfectam natam esse adparet; nihil ergo in corpore nostro dari, quod indurari nequeat. Lapillos aliquos in lente crystallinâ repertos fuisse legi. Ejusmodi autem morbus, nescio an visus sit, qualem hæc opportunitas nobis obtulit." (Obs. Pathol. Oper. Min. Obs. 15.)

Fabricius Hildanus Lancisi, as quoted by Heister, Morgagni, Morand, Zinn, and Pellier, make distinct mention of calculi in the interior of the eye.

(*Scarpa sulle Malattie degli Occhi. Venezia. 1802.*)

EYE CANCER, and Extirpation of. Cancer of the eye may make its attack on both sexes, and at any period of life. It seems, however, that the disease is most frequent in childhood. Experience has shewn, that, at the Hôtel Dieu more than one-third of the patients, on whom Desault operated, were under twelve years of age. The complaint sometimes comes on after an obstinate ophthalmia; sometimes after a blow on the eye, after wounds, a staphyloma, and, often, after fungous excrescences, which form on the surface, or in the interior of the eye. The disease is said to have been caused by the imprudent employment of topical irritating applications; very frequently the causes are constitutional ones.

The following symptoms commonly indicate its attack, and accompany its progress. Head-achs, and an unusual heat in the organ, are the forerunners of the disease. An uneasy itching affects the eye and adjacent parts. The organ frequently weeps a great deal, and from

being from the first irritably sensible of the impression of light, it soon becomes unable to bear it without pain, unless, indeed, some previous disease should have rendered the organ incapable of transmitting the rays of light to the retina. To the itching succeeds, at the end of a certain time, a pricking sensation, which is followed by a pain, that is not very acute at first, but, afterwards, becomes extremely poignant and lancinating.—The eye enlarges, and assumes not the red colour of ophthalmy, but a dull hue, ending in a livid, yellowish, or blackish one. Sight becomes obstructed and destroyed; the pains grow more acute, and the size of the organ increases, not as in hydrophthlmy, according to its natural dimensions, but, by an unequal enlargement of its surface, which becomes rough and irregular. As the magnitude of the part increases, so does the hardness. The cornea, after turning whitish, reddish, and livid, ulcerates and bursts, and fungous growths project from the opening, discharging a purulent fetid sanies.

The disease continuing, a manifest disproportion is seen between the eye and the orbit. As in hydrophthlmy, the organ projects out beyond the margin of this cavity, and forms a hideous prominence on the face. The portion of the conjunctiva, naturally reflected over the inside of each eye-lid, becomes separated in consequence of being dragged by the eye, to the front of which it applies itself, forming a reddish kind of band over it.

The suppuration puts on a more formidable aspect. The fungi increase, and become livid and dark-coloured. Hemorrhages follow, more or less frequently, and copiously. The pains, now more incessant, continually torment the patient, and, if art does not now interfere, the eye-lids next swell, inflame, and become scirrhus. The lower one, over which the sanies flows, is excoriated; fungi arise from it; and the disease is propagated to the cheek, and nose, so as to present, perhaps, one of the most terrible pictures, which external disease can form. The os planum or the os ethmoides is rendered carious, as well as the os unguis; the pituitary membrane is affected; the pains increase, and become general; and the cancerous diathesis afterwards makes its appearance.

The progress of the disease does not regularly follow the above course. It varies, according as a blow, a disease, or a cancerous disposition, has been the cause. It is enough to state here, however, that the patient is always brought

to the grave by a terrible death, if the disease be not extirpated. As surgery possesses no means of curing this affliction, the only plan is to remove the part affected, and practitioners, more timid in this, than other cases of cancer, never ventured to undertake the extirpation of the eye, till several ages, after they had done that of other cancerous parts.

The ancients are silent on this operation, and it is to the German surgery, that we are indebted for the first proposals of the kind. It was, for the first time, practised in the sixteenth century, with a very coarsely constructed instrument, shaped like a spoon, with cutting edges, and, by means of which, the eye was separated from the surrounding parts, and taken out of the orbit. But, this instrument, invented by Bartsch, was too large to reach to the deep contracted part of the orbit, so that either a part of the disease was left behind, or the thin delicate bones of the orbit were fractured, when the instrument was introduced too far. Fabricius Hildanus learnt these inconveniences from experience, and, to avoid them, devised a sort of probe-pointed bistoury; a better instrument, but not free from objections, and forgotten for near a century afterwards; surgeons continuing to use sometimes the above spoon, sometimes, various kinds of hooks. Muys, Bartholine, &c. afford examples of operations so performed. Bidloo, more judicious, than his predecessors, made use of scissars, and a pointed bistoury. His mode of operating, though not very methodical, was crowned with several successes, a circumstance in its favour, as M. Louis has observed.

A lancet seemed to Lavauguyon sufficient for extirpating the eye, and he is the first French surgeon, who has spoken of this operation. All the surgeons of that country considered the operation, as useless, cruel, and dangerous, until St. Ives mentioned, that he had done it with success, without, however, describing the plan, which he followed. There are engraved, in the *Institut. Chirg.* two tumours of the kind now under consideration, which the author removed with the bistoury, alone, which he thinks quite sufficient, and preferable to the means employed by Bartsch, Hildanus and Muys. Several English surgeons, have used a sort of curved knife, an engraving of which is given in B. Bell's system; but, in dissecting the tumour, this instrument is not so convenient as a straight bistoury.

Thus far the plans of operating, advised by authors, were not guided by any fixed rules. M. Louis endeavoured to lay down such rules, and his method has, for

a long while, been mostly adopted in France. It consists in dividing the attachments of the eye to the eye-lids; then those of the small oblique muscle; next, those of the great oblique muscle; then those of the levator palpebræ superioris, varying according to their insertions, the manner of holding the knife. The eyeball is afterwards detached, and the four straight muscles, and optic nerve, divided with a pair of scissors.

This way of operating, founded upon anatomical principles, seems at first glimpse to offer a method, in which, as M. Louis remarks, each stroke of the instrument is guided by the knowledge of the parts. But it is to be noticed, that these parts, being altered by disease, most commonly do not present the same structure and relations, which they do in the natural state; and that the flattened, lacerated, destroyed muscles, on their being confused with the eye itself, cannot serve, as in lithotomy, for the foundation of any precept relative to the operation. Besides, why use both the knife and scissors? The latter instrument is obviously useless, though M. Louis seems to think the operation cannot be done without it. The inclination of the outer side of the orbit will always allow a bistoury to be carried to the bottom of this cavity, so as to divide from above downwards, the optic nerve, and muscular attachments, which are to be drawn forward so as to render them tense.

Guided by the above principles, Desault, after having practised, and taught the method of M. Louis, returned to Heister's advice, who wishes only a bistoury to be employed. To have an exact idea of the mode of operating, which is always easy and simple with this one instrument, we must suppose the carcinoma to be in three different states. 1. When the tumour hardly projects out of the orbit, so that the eye-lids are free. 2. When it is much larger, projects considerably forward, and pushes in this direction the healthy eye-lids, which are in contact with it, together with a portion of the conjunctiva, which invests them, and is now detached from them. 3. When, in a much more advanced period, the eye-lids participate in the cancerous state. In the first case, the eye-lids must be separated from the eye, by cutting through the conjunctiva, where it turns to be reflected over the globe of the eye. In the second instance, the eye-lids and conjunctiva, which are in contact with the diseased eye, must be dissected from it. In the third, these parts must be cut away, together with the eye. (*Œuvres*

Chirurg, de Desault, par Bichat. Tom. 2.)

After the above observations, it only seems necessary to annex a few brief directions for operating.

When the eye-ball is exceedingly enlarged, it is necessary to divide the eye-lids at the external angle, in order to facilitate the operation. The surgeon can in general operate most conveniently when he employs a common dissecting knife, and when his patient is lying down with his face exposed to a good light. In cutting out a diseased eye, it is necessary to draw the part forwards, regularly as its surrounding attachments are divided, in order that its connexions, which are still more deeply situated, may be got at with the knife. This object cannot be very well accomplished with the fingers, or forceps, and, therefore, most surgical writers recommend us, either to introduce a ligature through the front of the tumour, or to employ a hook, for the purpose of drawing the part in any direction, during the operation, which the necessary proceedings may require. When the eye-lids are diseased, they must be removed; but, when prudence sanctions their being preserved, this is an immense advantage. The eye must not be drawn out too forcibly, before the optic nerve is divided, and care must be taken not to penetrate any of the foramina, or thin parts of the orbit, with the point of the knife, for fear of injuring the brain.—Great care should also be taken to leave no diseased parts behind, in the orbit. The hemorrhage may always be securely stopped by filling the orbit with scraped lint. It is constantly advisable to remove the lachrymal gland, as this part seems to be particularly apt to be the source of such inveterate fungous diseases, as too often follow the operation.

The antiphlogistic treatment is proper for a few days afterwards. Sometimes, fungous granulations continually form in the orbit, notwithstanding they are repeatedly destroyed, and the patient is at last exhausted. Sometimes, the disease in the orbit extends even to the brain, and produces fatal consequences. When malignant fungous excrescences grow from the cornea alone, it is clearly unnecessary to extirpate the whole eyeball.

For information, relating to the subjects of this article, consult particularly *Mémoire sur plusieurs Maladies du Globe de l'Œil; ou l'on examine particulièrement les cas qui exigent l'extirpation de cet organe, et la Méthode d'y procéder; par M. Louis, in Mém. de l'Acad. de Chirurgie. Tom. 13, p. 262. Edit. in 12 mo. Bertrandi,*

Traité des Operations de Chirurgie, p. 519, Edit. 1784, Paris. *Sabatier, de la Médecine, Opératoire*, Tom. 3, p. 54, Edit. 1, *Richter's Anfangsgrunde der Wundarzneykunst*, Band. 3, p. 415, Gottingen, 1795. *Mémoire sur l'Extirpation de l'Œil Carcinomateux in Œuvres Chirurgicales de Desault par Bichat*, Tom. 2, p. 102. *Richerand, Nosographie Chirurgicale*, Tom. 2, p. 103, &c. Edit. 2. Ware, in *Transactions of the Medical Society of London*, Vol. 1. part 1, p. 140, &c. *Lassus, Pathologie Chirurgi-*

cale, Tom. 1 p. 450. Edit. 1809. *Wardrop on Fungus Hæmatodes*, p. 93, &c.

EYE, DROPSY OF See *Hydrophthalmia*

EYE, INFLAMMATION OF. See *Ophthalmia*.

For other diseases of the eye, refer to *Amaurosis*; *Cataract*; *Cornea*; *Encanthis*; *Exophthalmia*; *Gutta Serena*; *Hemeralopia*; *Iris*; *Prolapsus of*; *Hypopium*; *Leucoma*; *Nyctalopia*; *Pterygium*; *Pupil*, *Closure of*; *Staphyloma*, &c. &c.

F.

FASCIA. (from *fascis*, a bundle, because, by means of a band, materials are collected into bundles.) A bandage, fillet, or roller. See *Bandage*.

FEVERS, SURGICAL. Under this head we comprehend two species of fever, viz. the *inflammatory*, and the *hectic*, which are particularly interesting to surgeons, because frequently attendant on surgical disorders.

We have mentioned, in treating of inflammation, that a febrile disturbance of the constitution is attendant on every considerable inflammation. In the present article, we shall endeavour to give some account of the particulars of this disorder.

The fever about to be described, is known and distinguished by several names; some calling it *inflammatory*; some *symptomatic*; and others *sympathetic*. It is sometimes idiopathic; that is to say, it occasionally originates at the same time with the local inflammation, and from the same causes. (*Burns*.) In other instances, and, indeed, we may say, in all ordinary surgical cases, it is symptomatic; or, in other words, it is produced, not directly by the causes, which originally produced the inflammation, but in consequence of the sympathy of the whole constitution for the disturbed state of a part.

The idiopathic inflammatory fever is said to be always preceded by chilliness. The symptomatic, or sympathetic inflammatory fever, sometimes takes place so quickly, in consequence of the violence of the exciting cause, or of the local inflammation, that no preceding coldness is observable. If, however, the local inflammation be more slowly induced, and, consequently, operate more gradually on

the system, then the coldness is evidently perceived. The symptomatic fever, induced by scalding, or burning a part, is quickly produced, and we have very little time to attend to the period of formation. On the other hand, the symptomatic fever, induced by wounds, is excited more slowly, and the period of formation is longer. This fever is not produced, when the inflammation only affects parts in a slight degree; but, it consequently makes its appearance, if the local inflammation be considerable, or if it affect very sensible parts. (*Burns*.)

The degree, in which this fever is excited, does not altogether depend upon the absolute quantity, or violence of the inflammation; but, in a great measure, upon the degree of the local inflammatory action, compared with the natural power and action of the part affected. Parts, in which the action is naturally low, are extremely painful when inflamed, and the system sympathizes greatly with them. Hence, the constitution is very much affected, when tendons, bones, or ligaments, are the parts inflamed. Severe inflammation of a large joint, every one knows, is apt to excite the most alarming, and even fatal derangement of the system. When very sensible parts are inflamed; for instance, the eye; the symptomatic fever is generally more considerable, than it would be, were it to arise from an equal quantity and degree of inflammation in a less sensible organ.

In common parts, as muscles, cellular membrane, skin, &c. the symptoms will be acute; the pulse strong and full, and the more so, if the inflammation be near the heart; but, perhaps, not so quick, as when the part is far from it. The stomach will sympathize less, and the blood will

be pushed farther into the small vessels. (*Hunter.*)

If the inflammation be in tendinous, ligamentous, or bony parts, the symptoms will be less acute, the stomach will sympathize more, the pulse will not be so full, but, perhaps, quicker; there will be more irritability, and the blood will not be so much pushed into the small vessels, and, therefore, it will forsake the skin. (*Hunter.*)

It seems to be a material circumstance, whether the inflammation is in the upper, or lower extremity; that is, far from, or near to the heart, for the symptoms are more violent, the constitution more affected, and the power of resolution less, when the part inflamed is far from the source of the circulation, than when near it, even when the parts are similar, both in texture and use. (*Hunter.*)

If the heart, or lungs, are inflamed, either immediately, or affected, secondarily, by sympathy, the disease has more violent effects upon the constitution than the same quantity of inflammation would have, if the part affected were not a vital one, or one with which the vital parts did not sympathize. If the part be such as the vital ones readily sympathize with, then the sympathetic action of the latter will affect the constitution as in an inflammation of the testicle. (*Hunter.*) In such cases, the pulse is much quicker and smaller, and the blood is more sily than if the inflammation were in a common part, such as muscle, cellular membrane, and skin. (*Hunter.*)

When the stomach is inflamed, the patient feels an oppression and dejection through all the stages of the inflammation; the pulse is generally low and quick, and the pain obtuse, strong, and oppressing; such as the patient can hardly bear. If the intestines are much affected, the same symptoms take place, especially if the inflammation be in the upper part of the canal; but, if only the colon be affected, the patient is more roused, and the pulse is fuller, than when the stomach only is inflamed. When the uterus is inflamed, the pulse is extremely quick and low. When the inflammation is either in the intestines, testicle, or uterus, the stomach generally sympathizes. In inflammation of the brain, the pulse varies more, than in the same affection of any other part; and, perhaps, we must, in this instance, form a judgment of the complaint, more from other symptoms, than the pulse. (*Hunter.*)

When the inflammation is situated in a part, not very essential to life, and occasions the general affection of the system, called inflammatory fever, the pulse is

fuller and stronger, than common, and the blood is pushed further into the extreme arteries than when the inflammation is in a vital part. The patient, after many occasional rigors, is at first rather roused. The pulse is, as above described, when the constitution is strong and not irritable; but, if this be extremely irritable and weak, as in many women, who lead sedentary lives, the pulse may be quick, hard, and small, at the commencement of the inflammation, just as if vital parts were concerned. The blood may also be sily; but it will be loose and flat on the surface. (*Hunter.*)

We may set down the ordinary symptoms of the inflammatory fever, occurring in consequence of local inflammation in common parts, and in a healthy habit, as follows: The pulse is frequent, full, and strong; all the secretions are diminished; the patient is vigilant and restless; the perspiration is obstructed, and the skin is hot and dry; the urine is high-coloured, and small in quantity; the mouth is parched, and the tongue furred; there is an oppressive thirst experienced; disturbance of the nervous system; loss of appetite and sleep; and, in some cases, delirium.

OF WHAT IS TO BE DONE FOR THE RELIEF OF THE INFLAMMATORY FEVER.

Upon this part of the subject very little is to be said; for, as the febrile disturbance of the system is produced, and entirely kept up, in almost every instance, by the local inflammation, it must be evident, that the means employed for diminishing the exciting cause, are also the best for abating the constitutional effects. Hence, it very seldom happens, that any particular measures are adopted expressly for the fever itself; as this affection is sure to subside in proportion as the local inflammation is lessened, or resolved. But, when the febrile disturbance is considerable, and the inflammation itself is also considerable, the agitated state of the system may have in its turn a share in keeping up, and even increasing, the local affection, and should be quieted as much as possible. However, in these very instances, we should, in all probability, be led to a more rigorous adoption of the antiphlogistic plan of treatment, from an abstract consideration of the state of the local inflammation itself, without any reference to that of the constitution. Indeed, the increased action of the heart and arteries, and the suppression of the secretions, require the employment of antiphlogistic means, and antimonials, the very same things, which

are indicated for the resolution of the local inflammation itself. Bleeding, purging, cold drinks, low diet; the exhibition of the antimonium tartarizatum, James's powder, or the common antimonial powder; and bathing the feet and body in warm water, are measures, which have the greatest efficacy in tranquillizing the constitutional disturbance implied by the term inflammatory fever. But, I think it right to repeat, that it is hardly ever necessary to have recourse to such an evacuation as general bleeding, merely on account of the fever; as this is only an effect, which invariably subsides, in proportion as the local cause is diminished.

HECTIC FEVER.

The sympathetic, or symptomatic fever, already described, is an *immediate* affection of the constitution, in consequence of some local disorder; the hectic fever is a *remote* one. When the hectic fever is a consequence of local disease, it has commonly been preceded by inflammation and suppuration; but, there is an inability to accomplish granulation and cicatrization: and the cure, of course, cannot be accomplished. The constitution may now be said to be oppressed with a local disease, or irritation, of which it cannot remove itself.

A distinction should be made, between a hectic fever, arising entirely from a local complaint in a good constitution, which is only disturbed by too great an irritation, and a hectic fever, arising principally from the badness of the constitution; which does not dispose the parts to heal. In the first species, it is only necessary to remove the part (if removable,) and then all will do well; but, in the second nothing is gained by a removal of the part, unless the wound, made in the operation, is much less, and more easily put into a local method of cure; by reason of which, the constitution sinks less, under this state and the operation together, than under the former one. Here the nicest discrimination is requisite. (*Hunter*)

The hectic fever comes on at very different periods after the inflammation, and commencement of suppuration, owing to a variety of circumstances. Some constitutions having less powers of resistance, than others, must more easily fall into this state.

The hectic fever takes its rise from a variety of causes, but, which have been divided into two species, with regard to diseased part; viz parts called vital, and others not of this nature. Many of

the causes of hectic fever, arising from diseases of the vital parts, would not produce this constitutional affection, if they were in any other part of the body; such, for instance, is the formation of tumours, either in, or so as to press upon, a vital part, or one, whose functions are immediately connected with life. Scirrhi in the stomach, and mesenteric glands; diseased lungs, liver, &c. produce hectic fever very soon.

When hectic fever arises from a disease of a part, that is not vital, it commences sooner, or later, according as it is in the power of the part to heal, or continue the disease. If the part be far from the source of the circulation, the fever will come on sooner, with the same quantity of disease. When the disease is in parts, which are not vital, and excites hectic fever, it is generally in situations, where so much mischief happens as to affect the constitution, and where the powers of healing are little. This is the case with diseases of most joints. We must also include parts, which have a tendency to such specific diseases, as are not readily cured in any situation.

Although hectic fever commonly arises from some incurable local disease of a vital part, or of an extensive disease of a common part, yet it is possible for it to be an original disease in the constitution, without any local cause whatever, that we know of.

Hectic is a slow mode of dissolution: the general symptoms are those of a low, or slow fever, attended with weakness. But, there is rather weak action, than real weakness; for, upon the removal of the hectic cause, the action of strength is immediately produced, and every natural function is re-established, however much it was impaired before.

The particular symptoms are debility; a small, quick, and sharp pulse; the blood forsakes the skin; loss of appetite; frequently, a rejection of all aliment from the stomach; wasting; a great readiness to be thrown into sweats; spontaneous perspirations, when the patient is in bed; the urine is pale-coloured, and very copious; and there is often a constitutional purging.

Hectic fever has been imputed to the absorption of pus into the circulation; but, this cause has been much exaggerated, as concerned in occasioning many of the bad symptoms, which frequently attack persons, who have sores. The hectic fever almost constantly attends suppuration, when in particular parts, such as vital ones. It also attends many inflammations, before actual suppuration takes place, as in cases of white swelling

of the large joints. The same quantity and species of inflammation and suppuration in any of the fleshy parts, especially such as are near the source of the circulation, have in general no such effect. Hence, in the first instances, the fever is only an effect on the system, produced by a local complaint, that has a peculiar property.

The constitution sympathizes more readily with diseases of vital parts, than with those of any other parts; their diseases are also in general more difficult of cure, than the same affections of parts, which are not vital. All diseases of bones, ligaments, and tendons, affect the constitution more readily than those of muscles, skin, cellular membrane, &c.

When the disease is in vital parts, and is such as not to kill, by its first constitutional effects, the system then becomes teaz'd with a complaint, which is disturbing the *necessary actions of health*. In the large joints, a disease continues to harass the constitution, by attacking parts, which have no power, or rather, no disposition to produce a salutary inflammation and suppuration. Thus, the system, is also irritated by the existence of an incurable disease. Such is the theory of the cause of hectic fever.

If the absorption of matter always produced the symptoms, above described, how could any patient, who has a large sore, possibly escape becoming hectic? for, there is no reason to suppose, that one sore can absorb more readily than another. If absorbed matter occasioned such violent effects as have been commonly ascribed to it, why does not venereal matter do the same? We often know, that absorption is going on, by the progress of bubões. A large one, just on the point of bursting, has been known to be absorbed, in consequence of a few days' sea-sickness. The person continued at sea for four and twenty days afterwards; yet, no hectic symptoms followed, only the specific constitutional effects, which are of a very different description.

Matter is sometimes formed on the inside of the veins, when their cavities are inflamed, and this matter cannot fail to get into the circulation; yet, hectic symptoms do not arise. Also, very large collections of matter, which have been produced without visible inflammation, as many abscesses of the scrophulous kind, are wholly absorbed, in a very short time, but no bad symptoms are the consequence. (*Hunter*.)

Hence, we may conclude, that the absorption of pus has no share in occasioning hectic fever. Many arguments might

be adduced to shew the absurdity of the doctrine; but, we can here only refer the reader to what Mr. Hunter has said farther on the subject, in his work on inflammation.

It is much more probable, that the hectic fever arises from the effect, which the irritation of a vital organ, or other parts, such as joints, have on the constitution, when either incurable in themselves, or are so for a time to the constitution. (*Hunter*)

TREATMENT OF HECTIC FEVER.

We have no method of curing the consequences above related. All relief must depend on the cure of the cause, (*viz.* the local complaint) or on its removal.

Tonic medicines have been recommended, on account of the evident existence of great debility. Antiseptics have also been given, in consequence of the idea that, when pus is absorbed, it makes the blood disposed to putrify. For these reasons, bark and wine have been exhibited.

Bark will, in most cases, only assist in supporting the constitution. Until the cause is removed, however, there seems no prospect of curing a disorder of the constitution. It is true, tonic medicines may make the system less susceptible of the disease, and also contribute to diminish the cause itself, by disposing the local complaints to heal. When, however, the hectic fever arises from a specific disease, such as the venereal, though bark may enable the constitution to bear the local affection better, than it otherwise could do, yet, this medicine can never remove the syphilitic mischief. (*Hunter*.)

No medicine, not even bark itself, has any direct power of communicating strength to the human constitution. All that can be done, in the treatment of hectic fever, when it is thought inexpedient, or impracticable, to remove the morbid part, is to combat particular symptoms, and to promote digestion. It is by bringing about the latter object, that bark is useful in these cases. The infusion of cinchona being more apt to agree with the stomach, than the decoction, or powder, should generally be preferred. Nourishing food, easy of digestion, should be frequently taken, in small quantities at a time. Nothing is more prejudicial to a weak constitution, than over-loading the stomach. Wine may also be given, but not too freely, and, not at all, if it should create heartburn, as it sometimes does in hectic patients. Madeira is less apt to have this disagreeable effect, than port. In these cases, it is

likewise often found useful to administer gentle cordial aromatic draughts. But, of all medicines, opium is perhaps the most valuable to those, who are afflicted with hectic fever; it alleviates pain, procures sleep, and checks the diarrhoea, which so frequently attends such cases.

When the local complaint, connected with the fever, is totally incurable, it must, if possible, be removed by a manual operation. Thus, when a diseased joint keeps up hectic fever, and seems to present no hope of cure, amputation must be performed. But, when the local disease holds forth the chance of being cured, provided the state of the constitution were improved, the surgeon is, in this circumstance, to endeavour to support the patient's strength. Great discretion, however, must be exercised, in deciding how long it is safe to oppose the influence of an obstinate local disease over the system, by the power of medicine. Although patients, in an abject state of weakness, have oftentimes been restored to health by a removal of the morbid part, yet many have been suffered to sink so low, that no future treatment could save them from the grave. Clemency in the practice of surgery, does not consist so much in delaying strong and vigorous measures, as in boldly deciding to put them in execution, as soon as they are indicated.

When the hectic fever arises from local diseases in parts, which the constitution can bear the removal of, the morbid part should be taken away, if it cannot be cured, consistently with the advice already given. When the disease arises from some incurable disease, in an extremity, all the abovementioned symptoms cease, almost immediately after the limb has been taken off. A hectic pulse, at one hundred and twenty, has been known to sink to ninety in a few hours after the removal of the hectic cause. Persons have been known to sleep soundly the first night afterwards, who had not slept tolerably for weeks before. Cold sweats have stopped immediately, as well as those, called colliquative. A purging has immediately ceased, and the urine begun to drop its sediment. (*Hunter.*)

FIBULA. (*quasi figula*, from *figo*, to fasten.) So named from its resemblance to a Roman clasp. The small bone of the leg. (See *Fractures and Dislocations.*)

FICATIO, or FICUS. (a fig.) A tubercle about the anus, or pudenda, resembling a fig.

FINGERS, ABSCESSSES OF. (See *Whitlow.*)

FINGERS, Amputation of. (See *Amputation.*)

FINGERS, Curies of. In these cases, the surgeon is to endeavour to extract the exfoliating portions of bone, immediately they become loose. For this purpose, he is justified in making such incisions, as will enable him to fulfil the object in view. Until the process of exfoliation is sufficiently advanced, he can do little more, than apply simple dressings, and keep the part in a clean quiet state.

When the separation of the dead pieces of bone will certainly destroy the utility of the finger, and convert the part into, an inconvenient, stiff appendage to the hand; or, when the patient's health is severely impaired by the irritation of the disease, the termination of which cannot be expected, within a moderate space of time; amputation is proper. It is a truth, however, that many fingers are amputated, which might be preserved, and surgeons ought to consider well, before presuming to remove part, which, when curable, may become of the greatest consequence, in regard to the perfection of the hand. The bread of many persons, it is well known, depends on the unimpaired state of certain fingers. These remarks are offered, because I have seen several surgeons, fond of seizing every opportunity of cutting their fellow creatures, remove fingers, which might have been usefully saved, either, by allotting a little more time for the exfoliation, or by making incisions, and cutting out the dead piece of bone.

FINGERS, Dislocations of. (See *Dislocation.*)

FINGERS, Fractures of. (See *Fracture.*)

FINGERS SUPERNUMERARY. Children are occasionally born with more fingers, than are natural, and since allowing the redundant number to remain would keep up deformity, and create future inconvenience, the surgeon is called upon to amputate them. The redundant fingers are sometimes with, sometimes without, a nail; are seldom more numerous, than one upon each hand; are generally situated just on the outside of the little fingers; and, as far as my observation extends, are incapable of motion, in consequence of not being furnished, like the rest of the fingers, with muscles. The best plan is to cut off supernumerary fingers with a scalpel, at the place, where they are united to the other part of the hand. The operation should be performed, while the patient is in the infant state, that is to say, before the superfluous parts have acquired much size, and while the object can be accomplished with the least pain. The incisions ought to be made, so as to form a wound with edges, which will admit of being brought tog e-

ther with strips of adhesive plaster. As soon as the dressings are applied, the hemorrhage will almost always cease, without a ligature.

FISSURE. (from *findo*, to cleave asunder.) A very fine crack in a bone, has this term often applied to it. (See *Fracture*.)

FISTULA, in surgery, strictly means a sore, which has a narrow orifice, runs very deeply, is callous, and has no disposition to heal. The name is evidently taken from the similitude, which the long cavity of such an ulcer has to that of a pipe or reed. A fistula commonly leads to the situation of some disease keeping up suppuration; and from which place the matter cannot readily escape. No technical term has been more misapplied, than this; and no mis-interpretation of a word has had worse influence in practice, than that of the present one. Many simple, healthy abscesses with small openings, have too often been called *fistulous*; and, being considered as in a callous state, the treatment pursued has in reality at last rendered them so, and been the only reason of their not having healed.

FISTULA IN ANO. See *Anus*.

FISTULA LACHRYMALIS. A disease arising from an obstruction in the ductus nasalis, and preventing the tears and mucus of the lachrymal parts of the eye from descending into the nose.

No one can have a proper conception of this disorder, without adverting to the anatomy, and functions, of the parts concerned. Hence, I shall first insert the interesting relation of these subjects, as delivered by Mr. Pott.

"That the motions of the eyelids may be performed with the utmost ease, that the tunica cornea may be kept constantly clean, bright, and fit for the transmission of the rays of light, and that dust, and other hurtful particles, may be immediately washed away, the surface of the eye is continually moistened by a fine limpid fluid.

"This fluid is derived principally from a large gland, situated under the upper edge of the orbit, near the outer corner of the eye, which gland is of the conglomerate kind, and lies in a small depression of the os frontis; its excretory ducts, or those by which it discharges the secreted fluid, piercing the tunica conjunctiva, just above the cartilaginous borders of the upper eyelids.

"While the caruncle was thought to be the secretory organ of the tears, this gland bore the title of glandula innominata; but, now, that its use and office are

known, it is called glandula lachrymalis.

"By irritation from any sharp or poignant particles, a large quantity of this fluid is immediately secreted, and by the motion of the eyelids is as immediately derived over the surface of the eye, by which means such particles are washed and wiped off. Sometimes also the passions of the mind produce an immediate increase of this lymph, which is, then strictly and properly called tears; a constant secretion of too large a quantity causes a disease, called epiphora; and a deficiency of it makes the motions of the lid difficult and painful.

"Although the fluid secreted by the lachrymal gland is considerable in quantity, yet, when it is not suddenly produced by irritation from without, or passion within, it is so constantly and gradually carried off, as to create neither trouble, uneasiness, nor blemish.

"The edge, or border of each eyelid, is formed by a thin cartilage, the figure and consistence of which keep the lids properly expanded; these cartilages are covered by a fine membrane, and are called cilia; their internal edges do, upon every motion, sweep over every point of the surface of the cornea; this motion, though almost imperceptible, unless attended to, is very frequently performed; and as the secretion of the fluid is also constant, the eye is by this means kept always moist, clean and bright.

"At the extremity of each of these cartilaginous borders of the eyelids, on the side next the nose, is a small papilla, or eminence; and in the middle of each of these is a small hole, or perforation, which being made in the cartilage, is not liable to collapse, while the parts are in a sound state, but remains always open; they are called the puncta lachrymalia; and their office is to receive the lachrymal fluid, as it runs off the cornea along the edges of the eyelids, thereby preventing it from trickling down the cheek; and that there may be no impediment to the constant execution of this office, during the time of sleep, as well as that of being awake, the internal edges of the cilia do not come into immediate contact with each other in that point where these orifices are.

"From each of these puncta lachrymalia proceeds a small membranous tube; which tubes soon enter into, or form a pouch or bag, situated near the inner angle of the eye, just below the union of the two lids, under the musculus orbicularis palpebrarum; the bag is called the sacculus lachrymalis, and its office is to receive all the lymph brought by the

puncta and ducts; the upper part of this sacculus lies in an excavation, formed partly by the nasal process of the os maxillare superius, and partly by the os unguis; the lower part of it is confined in a long channel, and forms a tube, or duct, which descending obliquely backward, communicates with the cavity of the nose, behind the os spongiosum superius, by an opening whose size is somewhat different in different subjects.

"This passage is called the ductus ad nares or the ductus nasalis, and through it whatever is received by the sacculus from the puncta does, in a healthy and sound state of these parts, pass into the nose.

"The membrane which lines this sacculus and duct, is in its structure much like to the membrana pituitaria narium, from the surface of which a clear viscid mucus is secreted, and by which the sacculus and passages are constantly moistened and kept pervious.

"While the parts are in a healthy, sound state, the fluid secreted by the lachrymal gland passes off through the puncta, sacculus, and duct, into the nose, without any trouble; but when they are in a diseased state, the case is otherwise. This membrane, like all other vascular parts, is liable to inflammation, by which means it often happens, that it is so thickened as to obstruct the nasal duct, and thereby much impede, or totally hinder the passage of any thing through it; in consequence of which obstruction the sacculus is filled by its natural mucus, and the derivation of the serum from the lachrymal gland through it being thus prevented, it runs off from the eyelid down the cheek; this obstruction continuing, and the mucus still lodging, the sacculus is dilated, and produces that tumour in the inner corner of the eye, and that discharge, upon pressure, which characterise the first state of the disease in question, and, in conjunction with several other attending symptoms, prove its seat to be in the lachrymal sac, and nasal duct.

"Although the seat of this disease is the same in almost every subject, yet its appearance is very different in different persons, and under different circumstances. These variations depend principally on—

1. The degree of obstruction in the nasal duct.
2. The state of the cellular membrane covering the sac.
3. The state of the sacculus itself.
4. That of the bone underneath.

5. The general state and habit of the patient.*

"Sometimes a serous kind of defluxion, by which the lining of the sac and duct are so thickened as to obstruct, or prevent the passage of the fluid through them into the nose, makes the whole complaint; and the cellular membrane on the outside not being diseased, there is no appearance of inflammation. In this case the duct is stopp'd, and the sacculus dilated, but without any alteration in the colour of the skin; a fulness appears in the cornea of the eye next to the nose; and upon the application of a finger to this tumour, a clear viscid mucus is discharged, through the puncta lachrymalia; the patient feels no pain, nor finds any inconvenience, except what is produced by the discharge of this mucus, and by the trickling of the lymph down the cheek.

"In some cases the mucus is not perfectly and always clear, but is sometimes cloudy, and looks as if it had a mixture of milk or cream in it; at first waking, some of it is generally found in the corner of the eye; and the eyelashes, being smeared over with it during sleep, most commonly adhere together in the morning.

"This is the most simple state of the disease, what the French have called the hernia, or hydrops sacculi lachrymalis: it is frequently met with in children who have been rickety, or are subject to glandular obstructions: and in this state it sometimes remains for some years, subject to little alterations, as the health or habit shall happen to vary, the sacculus being sometimes more, sometimes less full, and troublesome; the mucus which is pressed out, is sometimes more, sometimes less cloudy, and now and then it is attended with a slight ophthalmia, or an inflammation of the eyelids, but which, by common care, is easily removed.

"If the sacculus is not much dilated, the discharge small, and produced only by pressure, the chief inconveniences are the weeping eye, and the gumming together of the lids, after sleeping: but these, by being attended to, may be kept from being very troublesome; and, if the disease makes no farther progress, may be so regulated as to render any more painful process totally unnecessary.

* As the state and circumstances of this disease are really various, and differ very essentially from each other, the general custom of calling them all by the one name of fistula lachrymalis is absurd.

"If the dilatation is considerable, the swelling is more visible, and the quantity of mucus is larger; it is also in this state more frequently mixt and cloudy, and more troublesome, from the more frequent necessity of emptying the bag; but if the patient be adult, it may, even in this more dilated state of it, be kept from being very inconvenient.

"If an inflammation comes on, the tumour is thereby considerably increased, the discharge is larger, as well during sleep as upon pressure; the skin covering it loses its natural whiteness and softness, becomes hard, and acquires an inflamed redness; and with the mucus a mixture of something, which in colour resembles matter, is discharged, especially if the pressure be made with any force, or continued for any time: this circumstance, added to the painful sensation, and inflamed appearance of the parts, has been productive of a supposition, that in this state there is either an ulcer or an abscess within the sacculus or duct."

Mr. Pott next attempts to prove, that the contents of the sac are only of a mucous, not a purulent, quality.

On quitting this discussion, Mr. Pott remarks, "The inflammation of the cellular membrane covering the sac, is a circumstance which makes a considerable difference, both in the appearance of the disease, and in its requisite treatment; in some cases it is confined merely to the surface of the tumour in the corner of the eye; in others it spreads still farther, affecting the eyelids, cheek, and side of the nose.

"When the parts are in this state, the mucus within the bag has generally the appearance of being matter, that is, it wears a deep yellow colour, and is of a more thin consistence; if the puncta lachrymalia are naturally large and open, and the inflammation confined to the surface of the sac, its contents will pass off pretty freely, and the skin will remain entire; this is what the ancients called the simple, or imperfect, anchylops.

"But when the skin covering the lachrymal bag has been for some time inflamed, or subject to frequently returning inflammations, it most commonly happens, that the puncta lachrymalia are affected by it, and the fluid not having an opportunity of passing off through them, distends the inflamed skin, so that at last it becomes sloughy, and bursts externally. This is that state of the disease which is called perfect anchylops, or *agyllops*; the discharge which used to be made through the puncta lachrymalia, while the skin was entire, is now made

through the new opening; and, by ex-coriating the eyelids and cheek, increases the inflammation, and gives the disease a much more disagreeable appearance. In some, the matter bursts through a small hole, and after it has discharged itself, the tumour subsides, the neighbouring parts become cool, and though the skin covering the surface of the sacculus is sloughy and foul, yet there is no reason to believe that the sac itself is much diseased below; in others, the breach is large, the skin remains hard and inflamed, and from the appearance of the sore, there is reason to suppose the whole inside of the bag to be in a diseased state; and in some cases, which have been much neglected or irritated by ill treatment, the cavity of the sacculus seems to be filled with a loose ill-natured fungus, which gleans largely, and produces inflammation and excoriation of all the parts about.

"There is also another circumstance which sometimes is found to attend this disorder, viz. a carious state of the bones. This was by our forefathers supposed to be a frequent one, and was the principal reason for their so free use of caustic, cautery, and scalpra, in the treatment of it; but since the disease has been more minutely examined into, this circumstance has been found to be a very rare one. When the fistula lachrymalis is a symptom of the lues venerea, as it sometimes is, the bones are indeed often carious; but then, the fistula is not the original complaint, but produced secondarily, and is a consequence of the diseased state of the os ethmoides, and ossa spongiosa of the nose, and is not curable by any local means or applications, but depends entirely on the cure of the disease of which it is a symptom.

"I have also seen an abscess after the small-pox, which by falling on the lachrymal bag, has made it all slough away, and leave the bones bare; which circumstance I have also seen attend the free use of strong escarotics applied to destroy what is called the cyst; but without the accession of some other disorder producing it, or the most absurd method of treating the complaint, I believe that a caries of the bones will very seldom be met with. Indeed, the combination of other diseases, either of the general habit, or affecting the same, or the neighbouring parts, does often make a very material difference, both in the appearance of the disorder, in the prognosis, and in the proper method of treating it, which therefore should always be inquired into; for instance, the patient is sometimes subject to an habitual oph-

thlmy, or lippitudo, which will add to the deformity, and give a good deal of additional trouble during the cure; an oœna, or some other disease of the membrane, and cells of the ethmoid bone, or a polyposc excrecence within the nose, are now and then combined with it; the habit is sometimes, as I have before observed, infected with the lues venerea, of which this disease may be a symptom; strumous glandular obstructions are its too frequent companions; and, what is worst of all, it is sometimes cancerous."

TREATMENT OF THE FIRST STAGE OF THE FISTULA LACHRYMALIS.

Mr. Pott continues: "From what has been said, I think it will appear that this disease, in its primary and most simple state, consists in a detention or lodgment of mucus in the sacculus lachrymalis, in consequence of an obstruction of the natural passage from that bag into the nose; that by means of this lodgment the sacculus is distended, irritated, and sometimes inflamed; that the fluid which passes from the lachrymal gland over the eye to the puncta lachrymalia, being prevented by the fulness of the sac from getting into it, runs down the cheek; and therefore that the characteristic marks of the disorder, when recent, are a small tumour in the corner of the eye, an involuntary flux of serum down that side of the face, and a discharge of mucus through the puncta lachrymalia upon pressure.

"This lodgment, being originally produced by the stoppage of the natural duct, it follows, that the first curative intention is, the removal of that obstruction; which is sometimes practicable, but more often not; the degree of obstruction, its date, the state of the adjacent parts, and some other circumstances, rendering it more or less so in different subjects.

"That the inexperienced practitioner may be guarded against giving a hasty prognostic, or making attempts, which, however fatiguing to the patient, must in the end prove fruitless; and that he may be enabled to understand the disease more perfectly, I shall take the liberty to divide it into four general heads, or states, under which all its lesser distinctions may be comprehended.

"The first consists in a simple dilatation of the sacculus, and obstruction of the nasal duct, discharging upon pressure a mucus either quite clear, or a little cloudy; the skin covering the bag being entire and perfectly free from inflammation.

"In the second, the tumour is somewhat larger; the skin which covers it is in an inflamed state, but entire; and the discharge made through the puncta lachrymalia is of a pale yellow, or purulent colour.

"In the third, the skin covering the sacculus is become sloughy and burst, by which means the swelling is in some measure lessened; but the mucus, which while the skin was entire, used to be pressed out through the puncta lachrymalia, now discharges itself through the new aperture; the ductus ad nares, both in this and the preceding state, are not otherwise diseased, than by the thickening of its lining.

"In the fourth, the passage from the sacculus lachrymalis into the nose is totally obliterated, the inside of the former being either ulcerated, or filled up with a fungus, and attended sometimes with a caries of the bone underneath."

Our limits oblige us to pass over what Mr. Pott next states, concerning the practice of the ancients.

"In the first and most simple state of the disease, viz. that of mere obstruction, without inflammation, much pains have been taken to restore the parts to their natural state and use, without making any wound or division at all; the introduction of a probe, the injection of a fluid, and a constant compression made on the outside of the sacculus in the corner of the eye, are the principal means by which this has been attempted.

"Some few years ago, M. Auel made a probe of so small a size as to be capable of passing from the eyelid into the nose, being introduced at one of the puncta lachrymalia, and passing through the sacculus and duct; with which probe, he proposed to break through any small obstruction, which might be found in its passage.

"He also invented a syringe, whose pipe is small enough to enter one of the puncta, and by that means to furnish an opportunity of injecting a liquor into the sacculus and duct; and with these two instruments he pretended to be able to cure the disease whenever it consisted in obstruction merely, and the discharge was not much discoloured. The first of these, viz. the passage of a small probe through the puncta, has a plausible appearance, but will, upon trial, be found very unequal to the task assigned; the very small size of it, its necessary flexibility, and the very little resistance it is capable of making, are manifest deficiencies in the instrument; the quick sensation in the lining of the sac and duct, and its diseased state, are great objections on the

side of the parts, supposing that it was capable of answering any valuable end, which it most certainly is not.

"That the passing a fine probe from one of the puncta lachrymalia into the nose is very practicable, I know from experience; but I also know from the same experience, that the pain it gives, and the inflammation it often excites, are much greater, than any benefit, which does or can arise from it.

"It is said that the principal use of this probe is to clear the little ducts leading from the puncta into the sacculus, and the obstruction of those ducts is often mentioned as a part of this disease; by which one would be led to suppose that it was a circumstance which frequently occurred, whereas it is seldom if ever met with, and when it does happen, can never produce the disease in question; the principal characteristic of which is, a discharge into the inner corner of the eye upon pressure made in the angle; this discharge is made from the sacculus, through the puncta, and proves that the latter are open; the passing a probe therefore through these seems to be perfectly unnecessary, since a stoppage of them would never give rise to that disease, which consists in an obstruction to the passage of any thing from the sac into the nose, and not from the eye into the sac.

"The syringe, if used judiciously while the disease is recent, the sac very little dilated, and the mucus perfectly clear, will sometimes be found serviceable; I have used it where, I think, it has been much so; I have by means of it injected a fluid through the sacculus into the nose, and in two or three instances have effected cures by it; but I have also often used it ineffectually; it gives no pain, and a few trials render the use of it very little troublesome."*

* The following passage will shew, that the practice of Anel, was first received with much envy and opposition, and that every attempt has been made to strain sentences in old works beyond their allowable meaning, so as to lessen the merit of the proposal, and deprive it of the recommendation of originality. Cette manière de traiter la fistule lachrymale n'étoit point connue lorsque Anel l'a exécutée. Cependant elle ne parôit pas entièrement nouvelle; Plinie le jeune parle, dans le lib. 7, cap. 53, de son Histoire naturelle, d'un certain Caius Julius, Médecin, qui traitoit quelques maladies des yeux, avec des stylets qu'il introduisoit dans l'ocil. *Specillum per oculos tra-*

The screw, invented by Fabricius ab Aquapendente, for compressing the lachrymal sac, being now never used, we need not follow Mr. Pott in shewing its inapplicableness.

Mr. Pott continues; "Besides these means of attempting a cure without incision, the gentlemen of the French Academy have favoured us with some others, such as the introduction of a probe into the lower part of the nasal duct within the nose, the injection of a fluid by the same orifice, the passing a seton from the punctum lachrymale superius through the sacculus and duct, and out at the nostril, there to remain till the cure is completed; and, for those purposes, they have invented, and given figures of a number of probes, syringes, and many other instruments,

hens dum inungit specillum per oculos trahens. Ces passages n'ont point échappé au savant Morgagni, qui les rapporte dans sa sixieme adversaire, *animad.* 74, ou il parle de la méthode d'Anel. La méthode d'injecter les points lacrymaux ne lui a pas paru parfaitement nouvelle. Plater parle d'une fille attaquée de la fistule lachrymale, dont on injecta les voies lacrymales. Morgagni rapporte quelques autres faits qui peuvent servir à l'histoire des injections; mais, il faut avouer que les Ecrivains avoient parlé de cette méthode de sonder, et de celle d'injecter, en des termes si obscurs, et si laconiquement, que les Médecins ni les Chirurgiens n'eussent pu parvenir à l'exécuter, en la suivant literalment. Anel peut donc passer pour le véritable auteur; c'est d'après ses travaux qu'on a connu ceux des autres Ecrivains, et non d'après autrui qu'il est parvenu à sonder et à injecter les points lacrymaux. Cependant Anel trouva beaucoup de critiques et très peu d'approuvateurs. Plusieurs Médecins Italiens l'attaquerent, quelques Chirurgiens François parlerent contre lui d'une manière indécente. L'Académie des Sciences jugea mieux ses travaux. Elle trouva ses observations également nouvelles et ingénieuses." (*Histoire de l'Anatomie et de la Chirurgie, par M. Portal, Tom. 4, p. 398.*) With regard to *specillum per oculos trahens*, it appears to me, that the interpretation above laid down is quite unwarranted; and as for the introduction of injections into the lachrymal sac, Anel's predecessors, in all probability, injected the fluid through an ulcerated opening, or a puncture, into this sac, and, not through one of the puncta lachrymalia, as devised and practised by Anel himself. It is the latter method alone, that has peculiarity and merit.

which, they say, have been very successfully used; far be it from me to say that they have not, or to prevent any body from trying those, or any other means, by which mankind may be cured of diseases with the least possible fatigue and pain; but from the experiments which I have made of most of these processes, I must beg leave to suspend my assent to their general utility, or even to their frequent practicability.

"Repeated trials upon dead subjects will undoubtedly enable a man to pass the probe, or perhaps now and then the seton, but he will also find it often absolutely impracticable; and, in the few instances, in which he may chance to succeed, as to this attempt, what will in general be the consequence? not what the writers on these subjects have taught him to believe, a cure, but a sense of pain, and degree of inflammation, which the patient, before such attempts were made, was free from; an exasperation of the disease, and a loss of much time, as I have more than once experienced. To which consideration may be added, that infants and young children are very often afflicted with this disorder, and that such processes as these are absolutely impracticable upon them, &c.

"Anel's syringe I have used successfully, and think it may now and then be very well worth trying, in recent cases more especially, as it may always be used without giving any pain, or running the risk of raising an inflammation; but I must also beg leave to observe, that if the bag is not much dilated, the mucus clear, the skin and cellular membrane uninflamed, and the parts above soft and easy, if the patient will take care not to suffer too great an accumulation, will by the frequent use of a vitriolic collyrium, keep the eye-lids clean and cool, and carefully avoid such things as irritate the membrana narium, or occasion a sudden flux of lymph from the lachrymal gland, the disease may for many years, nay often for life, be kept from being very troublesome, or inconvenient, without any surgery at all." (Pott.)

In 1780, Sir William Blizard proposed, instead of injecting water, to introduce quicksilver through a small pipe communicating with a long tube full of this fluid. The specific gravity of the quicksilver, when the sac was distended with it, he believed would have more power, than water propelled through a syringe, to remove the lachrymal obstruction.

Mr. Ware, after trying Sir William Blizard's plan, gave the preference to Anel's syringe, with which he generally injects warm water, through the lower punctum lachrymale, into the lachrymal

sac, and puts a finger over the superior punctum to prevent the fluid from escaping through it. With this finger, the lachrymal sac should also be occasionally compressed, in order to assist the determination of the water downward into the nose. Mr. Ware has sometimes used the injection thrice a day, though, in general, much less frequently; and, he says, the success he has experienced is considerable. (See *Ware on the Epiphora*.)

"I in general begin the treatment by injecting some warm water through the inferior punctum lachrymale, and I repeat the operation four or five days in succession. If, in this space of time, none of the water pass through the duct into the nose, and if the watering of the eye continue as troublesome as it was before the injection was employed, I usually open the angular vein, or direct a leech to be applied near the lachrymal sac; adding here a caution, that the leech be not suffered to fix on either of the eye-lids, lest it produce an extravasation of blood in the adjacent cells. About the same time that blood is taken away in the neighbourhood of the eye, I usually vary the injection, and try the effects either of a weak vitriolic, or anodyne, lotion. In some instances also, when I have found it impossible, after several attempts, to inject any part of the liquid through the duct, I have introduced a golden probe, about the size of a bristle, through the superior punctum lachrymale, and, attending to the direction of the duct, have insinuated its extremity through the obstruction, and conveyed it fully into the nose; immediately after which I have found, that a liquid, injected through the inferior punctum, has passed without any difficulty; and by repeating these operations, for a few successive days, I have at length established the freedom of the passage, and completed the cure. In other instances, I have recommended a strongly stimulative sternutatory to be sniffed up the nose, about an hour before the time of the patient's going to rest, which, by exciting a large discharge from the schneiderian membrane, has sometimes also greatly contributed to open the obstruction in the nasal duct.

"Cases occur very rarely which may not be relieved by some of the means above related." (*Ware's Additional Remarks on the Epiphora*.)

When the discharge has been feid, Mr. Ware has sometimes found, that a vitriolic lotion, injected into the sac, has quickly corrected the quality of the matter.

Scarpa, in his *Osservazioni sulle principali Malattie degli Occhi*, maintains, that the chief part of the yellow viscid matter,

which accumulates in the lachrymal sac, is secreted by the lining of the eye-lids, and by the little glands of Meibomius; and that the altered quality of this secretion has a principal share in the cause of the disease. He states, that the truth of this fact may at once be ascertained by everting the eye-lids; and especially the lower one of the affected side; and by comparing them with those of the opposite eye. The former will always exhibit an unnatural redness of the internal membrane, which has a villous appearance, all along the extent of the tarsus, while their edges are swollen; and numerous varicose vessels are distinguishable on its surface. The follicles of Meibomius, are also turgid and prominent.

Hence, Scarpa advises making such applications to the inside of the eye-lids, as have a tendency to improve the quality of the secretion from them, at the same time, that attempts are made to remove the obstruction in the ductus nasalis. Mr. Ware, indeed, had previously noticed, that such treatment may occasionally be proper.

"When an epiphora is occasioned by an acrimonious discharge from the sebaceous glands on the edges of the eye-lids, it must be evident, that injections into the sac will be very insufficient to accomplish a cure, because the sac is not the seat of the disorder. The remedies that are employed must be directed, on the contrary, to the ciliary glands themselves, in order to correct the morbid secretion that is made by them; and for this purpose, I do not know any application that is so likely to prove so effectual as the unguentum hydrargyri nitrati, of the new London Dispensatory, which should be used here in the same manner, in which it is applied in common cases of the psorophthalmia. It will be proper to cleanse the eye-lids every morning, from the gum that collects on their edges during the night, with some soft unctuous applications; and I usually advise to apply to them, two or three times, in the course of the day, a lotion composed of three grains of white vitriol, in two ounces of rose, or elder-flower, water."

Mr. Ware very judiciously censures the plan of applying collyria to the eye by means of linen, wet in them; and he recommends eye-glasses for the purpose, or insinuating the fluid, between the eye and eye-lids, with a camel-hair pencil, thoroughly wet in the application. (*Additional Remarks on the Epiphora.*)

Scarpa also extols washing the eye, three or four times a day, with a vitriolic collyrium; and, besides praising the ointment recommended by Mr. Ware, he re-

commends Janin's ophthalmic ointment, to be smeared over the margins and lining of the eye-lids, every morning and evening.

℞. *Adipis. Suilla. Tutia prep. Bol. Armen. sing. ʒj. Calcis Hydrurg. alb ʒj. Misce.* To be used at first lowered with a larger proportion of lard, than is here ordered.

TREATMENT OF THE SECOND AND THIRD STAGES OF THE FISTULA LACHRYMALIS.

When the disease, says Mr. Pott, is not beyond the simple state just described, that is, when the parts round about are much, or constantly inflamed, or the skin, covering the tumour, is burst, there is something more to be done, if a cure is intended. In this state, an opening in the upper part of the sacculus lachrymalis becomes in general absolutely necessary; and, as a wound, made by a knife, leaves a much less disagreeable scar, than that which necessarily follows the bursting of the skin, one being a mere simple division, the other a loss of substance, it will always be found best to anticipate the accident of bursting, by making an opening, as soon as the integuments are in such a state as to threaten it.

If the sacculus is already burst, the opening, if necessary, is to be enlarged with a knife, or dilated. The incision made, the sacculus should be moderately distended with dry lint, or prepared sponge; by which means an opportunity will be gained, in two or three days, of knowing the state of the inside of the sac, and of the ductus nasalis; if the former is neither sloughy, nor otherwise diseased, and the obstruction in the latter but slight, sometimes after a free discharge has been made, for some days, and the inflammation, occasioned by the first operation, is gone off, the sac contracts itself, a superficial dressing, with moderate pressure, heals the sore, the lachrymal fluid resumes its wonted course, and the disease disappears. (*Pott.*)

When this simple method fails, the point to be aimed at, says Mr. Pott, is to render the nasal duct pervious; and, for this purpose, the passage from the sac to the nose, must be gradually distended, by passing either a probe, or a piece of catgut, or a bougie, gently into it, as far as it will go, and repeating it occasionally, until it is got quite through. (*Pott.*)

Such was the practice commonly pursued, till M. Pellier, and Mr. Wathen, recommended introducing a metallic tube down the ductus nasalis, and leaving it for a time in that situation, with a view of preventing the duct, after it had been made pervious from closing again. It

seems unnecessary to enter into a detail of their methods, which have now universally given place to a most simple mode of practice, devised by Mr. Ware, and explained by him in the following terms.

"Whenever a patient applies to me for relief, on account of an obstruction in the lachrymal passage, I always think it right to attempt to clear the canal from any inspissated mucus that may be lodged in it, by injecting some warm water through the inferior punctum lachrymale; joining with it, when necessary, a trial of the other remedies that have been proposed in the two papers on the epiphora, which were laid before the public in the years 1792 and 1795. But if, after the use of these for about a week or ten days, there be not some perceptible advance towards a cure, or, if, from the long continuance of the obstruction, there be reason to fear that it is too firmly fixed to yield to this easy mode of treatment, I do not hesitate to propose the operation which is now to be described. The only persons, with respect to whom I entertain any doubts as to the propriety of this opinion, are infants. In such subjects, I always think it advisable to postpone the operation, unless the symptoms be particularly urgent, until they are eight or nine years old.

"If the disease has not occasioned an aperture in the lachrymal sac, or if this aperture be not situated in a right line with the longitudinal direction of the nasal duct, a puncture should be made into the sac, at a small distance from the internal juncture of the palpebræ, and nearly in a line drawn horizontally from this juncture towards the nose, with a very narrow spear-pointed lancet. The blunt end of a silver probe, of a size rather smaller, than the probes, that are commonly used by surgeons, should then be introduced through the wound, and gently, but steadily, be pushed on in the direction of the nasal duct, with a force sufficient to overcome the obstruction in this canal, and until there is reason to believe that it has freely entered into the cavity of the nose. The position of the probe, when thus introduced, will be nearly perpendicular; its side will touch the upper edge of the orbit; and the space between its bulbous end in the nose and the wound in the skin will usually be found, in a full-grown person, to be about an inch and a quarter, or an inch and three-eighths. The probe is then to be withdrawn, and a silver style of a size nearly similar to that of the probe, but rather smaller, about an inch and three-eighths in length, with a flat head like that of a nail, but placed obliquely, that it may sit

close on the skin, is to be introduced through the duct in place of the probe, and to be left constantly in it. For the first day or two after the style has been introduced, it is sometimes advisable to wash the eye with a weak saturnine lotion, in order to obviate any tendency to inflammation which may have been excited by the operation; but this in general is so slight, that I have rarely had occasion to use any application to remove it. The style should be withdrawn once every day for about a week, and afterwards every second or third day. Some warm water should each time be injected through the duct into the nose, and the instrument be afterwards replaced in the same manner as before. I formerly used to cover the head of the style with a piece of dyachylon plaster spread on black silk; but have of late obviated the necessity for applying any plaster by blackening the head of the style with scaling-wax."

Mr. Ware did not on first trying this method, expect any relief, till the style was left off. However, he was agreeably disappointed, to find, that the watering of the eye ceased, as soon as the style was introduced, and the sight became proportionally more useful and strong.

The wound, which Mr. Ware makes in the sac, when there is no suitable ulcerated aperture, is only just large enough to admit the end of the probe, or style; and this soon becomes a fistulous orifice, through which the style may be passed without the least pain. In short, in about a week or ten days, the treatment becomes so easy, that the patient, or any friend, is fully competent to do what is necessary. It merely consists in withdrawing the style, two, or three times a week, occasionally injecting some warm water, and then replacing the instrument as before.

Some, finding no inconvenience from the style, and being afraid to leave it off, wear it for years; many others disuse it in about a month, or six weeks, and continue quite well. The ulcerations, sometimes existing over the lachrymal sac, commonly heal, as soon as the tears can pass down into the nose; but Mr. Ware mentions two instances, in which such sores did not heal until a weak solution of the hydrargyrus muriatus, and bark, were administered. (See *Ware on the Fistula Lachrymalis*.)

TREATMENT OF THE FOURTH STAGE OF THE FISTULA LACHRYMALIS.

The last stage is that, in which the natural passage, from the sacculus to the nose, is so diseased as to be quite oblite-

rated; or in which the bones are sometimes found to be carious.

The methods, hitherto described, have all been calculated to preserve the natural passage; they are sometimes successful; but, when they are not, there is no surgical means left, but to attempt the formation of an artificial one in its stead. The upper and hinder part of the sacculus lachrymalis is firmly attached to the os unguis, a small, and very thin bone, just within the orbit of the eye; which bone is so situated, that if it be by any means broken through, or removed, the two cavities of the nose and of the orbit, communicate with each other; consequently, the os unguis forms the partition between the hinder part of the lachrymal bag; and the upper part of the cavity of the nose; and it is by making a breach in this partition, that we attempt the formation of an artificial passage for the lachrymal fluid. (Pott.)

The cautery has now been long disused for making an aperture in the os unguis; and there are different instruments recommended for the purpose, such as a large, strong probe, a kind of gimblet, a curved trocar, &c; each of which, says the above elegant writer, if dexterously, and properly applied, will do the business very well; the one necessary caution is, so to apply whatever instrument is used, that it may pierce through that part of the bone which lies immediately behind the sacculus lachrymalis, and not to push too far up into the nose, for fear of injuring the os spongiosum behind, while it breaks its way. Mr. Pott adds, that he himself has always used a curved trocar, the point of which should be turned obliquely downward, from the angle of the eye, towards the inside of the nose. The accomplishment of the breach will be known by the discharge of blood from the nostril, and of air from the wound, upon blowing the nose. Care must be taken to apply the instrument to the part of the bone, anterior to the perpendicular ridge, which divides it.

As soon as the perforation is made, a tent of lint should be introduced, of such size as to fill the aperture, and so long as to pass through it into the cavity of the nose: this should be permitted to remain in two, three, or four days, till the suppuration of the parts renders its extraction easy; and, after that, a fresh one should be passed every day, until the clean granulating appearance of the sore makes it probable, that the edges of the divided membrane are in the same state. The business now is to prevent the incarcination from closing the orifice; for which purpose, the end of the tent may be moistened with spir. vitriol. ten. or a piece of lunar caus-

tie, so included in a quill, as to leave little more than the extremity naked, may at each dressing, or every other, or every third day, be introduced; by which the granulations will be repressed, and the opening maintained; and when this has been done for some little time, a piece of bougie of proper size, or a leaden cannula, may be introduced instead of the tent; and leaving off all other dressing, the sore may be suffered to contract as much as the bougie will permit; which should be of such length, that one extremity of it may lie level with the skin in the corner of the eye, and the other be within the nose.

The longer time the patient can be prevailed upon to wear the bougie, the more likely will be the continuance of the opening; and, when it is withdrawn, the external orifice should be covered only by a superficial pledget, or plaster, and suffered to heal under moderate pressure. (Pott.)

After the perforating instrument is withdrawn, Mr. Ware recommends a nail-headed style, about an inch long, to be introduced through the aperture, in the same way in which it is introduced through the nasal duct, in cases, in which the obstruction is not so great as to prevent its passing in this direction; and it may remain here with as much safety, as in this last mentioned instance, for as long a time as its continuance may be thought necessary to establish the freedom of the communication.

Mr. Ware is undoubtedly deserving of much honour for the improvement of this part of surgery; the following short passage of his own work fully shews in what his merits consist. "It may, perhaps, be thought, that the operation, which I have taken the liberty to recommend, has a close resemblance to that which was proposed by the late Mr. Pott. It will be found to differ from it, however, in many essential respects. Mr. Pott, for instance, as well as Mr. Warner and Mr. Bell, advises the operator to make a large opening into the lachrymal sac. On the contrary, I have proposed to make a small one. These gentlemen, again, afterwards recommend different kinds of dressings; some of which are difficult to be applied, and painful in their action. The dressing, which I have proposed, is confined simply and solely to a silver nail-headed style. Their operation is performed, and their dressings employed, in order to form a communication, through which the tears may afterward pass into the nose; and until their passage is formed, and the necessity for further dressings ceases, they do not encourage any hope, that the disorder will be removed. Experience, how-

ever, teaches me, that as soon as the style is introduced, the disorder immediately ceases; and the tears pass at once into the nose, either through the natural nasal duct, or through the perforation that is made by the operation in the thin part of the os unguis." (*Ware on the Fistula Lachrymalis*.)

The works, containing the most valuable information, relative to the present subject, are the *Mémoires de l'Académie de Chirurgie*, Tom. 5, Edit. 12mo, in which are several essays on the fistula lachrymalis: viz. one by M. Bordenave, entitled, "*Examen des Réflexions critiques de M. Molinelli, insérées dans les Mémoires de l'Institut de Bologne, contre le Mémoire de M. Petit, sur la Fistule Lachrymale, inséré parmi ceux de l'Acad. Royale des Sciences de Paris. Année 1734.*" Another essay by M. de la Forest, styled "*Nouvelle Méthode de traiter les Maladies du Sac Lachrymal, nommées communément Fistules Lachrymales.*" A third by M. Louis, called "*Réflexions sur l'Opération de la Fistule Lachrymale.*" Anel has described his plan of treatment in various works: "*Observation singulière sur la fistule lacrymale, dans laquelle l'on apprendra la méthode de la guérir radicalement.*" Turin, 1713, in 4o. "*Nouvelle Méthode de guérir les fistules lacrymales.*" Turin, 1713, in 4o. *Suite de la Nouvelle Méthode*, &c. *ibid.* 1714, in 4o. "*Dissertation sur la nouvelle découverte de l'hydropsie du conduit lacrymal.*" Paris, 1716, in 12mo. And, lastly, Anel has published in the *Mém. de l'Acad. des Sciences*, année 1713, "*Précis de sa Nouvelle manière de guérir les fistules lacrymales.*" Sabatier's *Médecine Opératoire*, Tom. 2, p. 371—406. Edit. 1. Richter's *Anfangsgrunde der Wundarzneykunst*, Band. 2, Kap. 11. Pott's observations relative to the disorder of the corner of the eye, commonly called the *Fistula Lachrymalis*; *Ware on the Epiplora and Fistula Lachrymalis*; Scarpa *sulle principali Malattie degli Occhi. Capo 1.* Wathen's *Tube for the Fistula Lachrymalis*, Lond. 1781.

FISTULÆ IN PERINÆO. When the methods recommended for the removal of strictures (See *Urethra, Strictures of*) have not been attempted, or not succeeded, nature endeavours to relieve herself by making a new passage for the urine, which, although it often prevents immediate death, yet, if not remedied, is productive of much inconvenience and misery to the patient through life. The mode by which nature endeavours to procure relief, is by ulceration on the inside of that part of the urethra which is enlarged, and within the stricture. The ulceration commonly begins near, or close to the stricture, although the stricture

may be at a considerable distance from the bladder. The stricture is often included in the ulceration, by which means it is removed; but, unluckily, this does not always happen. The ulceration is always on the side of the urethra, next to the external surface.

The internal membrane and substance of the urethra having ulcerated, the urine readily gets into the loose cellular membrane of the scrotum and penis, and diffuses itself all over those parts; and as this fluid is very irritating to them, they inflame and swell. The presence of the urine prevents the adhesive inflammation from taking place; it becomes the cause of suppuration wherever it is diffused, and the irritation is often so great that it produces mortification, first in all the cellular membrane, and afterwards in several parts of the skin; all of which, if the patient live, slough away, making a free communication between the urethra and external surface, and producing *fistula in perinæo*.

However, when the ulceration takes place further back than the portion of the urethra, between the glans penis and membranous part of this canal, the abscess is generally more circumscribed.

The urine sometimes insinuates itself into the corpus spongiosum urethræ, and is immediately diffused through the whole, even to the glans penis, so as to produce a mortification of all those parts.

Although the ulceration of the urethra may be in the perinæum, yet the urine generally passes easily forwards into the scrotum, which contains the loosest cellular substance in the body; and there is always a hardness, extending along the perinæum to the swelled scrotum, in the track of the pus.

Ulceration can only be prevented by destroying the stricture; but when the urine is diffused in the cellular membrane, the removal of the stricture will generally be too late to prevent all the mischief, although it will be necessary for the complete cure. Therefore, an attempt should be made to pass a bougie, for perhaps the stricture may have been destroyed by the ulceration, so as to allow this instrument to be introduced. When this is the case, bougies must be almost constantly used, to procure as free a passage forwards, in the right way, as possible. When the bougie cannot pass, the application of caustic would in many cases be too slow in its operation, and, in others, cannot be tried, by reason of the situation of the stricture.

While we are attempting to cure the stricture, antiphlogistic measures, particularly bleeding, are to be adopted. The

parts should be exposed to the steam of hot water; the warm bath made use of; opium and turpentine medicines given by the mouth, and in gylsters; with a view of diminishing any spasmodic affection. But, all these proceedings are often insufficient, and, therefore, an immediate effort must be made, both to unload the bladder, and prevent the further effusion of urine, by making an opening into the urethra, somewhere beyond the stricture, but, the nearer to it, the better.

Introduce a director, or some such instrument into the urethra, as far as the stricture, and make the end of it as prominent as possible, so as to be felt; which, indeed, is often impossible. If it can be felt, it must be cut upon, and the incision carried on a little farther, towards the bladder, or anus, so as to open the urethra beyond the stricture. This will both allow the urine to escape, and destroy the stricture. If the instrument cannot be felt, at first, by the finger, we must cut down towards it; and, on afterwards feeling it, proceed as above.

When the stricture is opposite the scrotum, as the opening cannot be made in this situation, it must be made in the perinæum, in which case, there can be no direction given by an instrument, as one cannot pass sufficiently far, and the only guide is our anatomical knowledge. The opening being made, proceed as directed in the cure of a false passage. (See *Urethra, False Passage of*.) In whichever way the operation is done, a bougie, or a catheter, which is better, must afterwards be introduced, and the wound healed over it.

When the inflammation, from the extravasation of urine, is attended with supuration and mortification, the parts must be freely scarified, in order to give vent both to the urine and pus. When there is sloughing, the incisions should be made in the mortified parts.

Sometimes, when the urethra is ulcerated, and the cellular membrane of the penis and prepuce is so much distended, as to produce a phymosis, it is impossible to find the orifice of the urethra.

Frequently the new passages for the urine do not heal, on account of the stricture not being removed: and even when this has been cured, they often will not heal, but become truly fistulous, and produce fresh inflammations and suppurations, which often burst by distinct openings. Such new abscesses and openings often form, in consequence of the former ones having become too small, before the obstruction in the urethra is removed.

Such diseases sometimes bring on intermitten disorders, which do not yield

to bark; but do not recur, when the fistula, and disease of the urethra, have been cured.

In order to cure fistula in perinæo, unattended with the above described urgent symptoms, the urethra must be rendered as free as possible, and, this alone is often enough; for, the urine finding a ready passage forwards, is not forced into the internal mouth of the fistula, so that these heal up. The cure of the strictures, however, is not always sufficient, and the following operation becomes indispensable.

The sinuses are to be laid open in the same manner as other sinuses, which have no disposition to heal. In doing this, as little as possible of the sound part of the urethra must be opened. Hence, the surgeon must direct himself to the inner orifice of the fistula, by means of a staff, introduced (if possible) into the bladder, and a probe passed into one of the fistulous passages. The probe should be first bent, that it may more readily follow the turns of the fistula. When it can be made to meet the staff, so much the better; for, then the operator can just cut only what is necessary.

When the fistula is so straight, as to admit of a director being introduced, this instrument is the best. When neither the probe, nor the director, can be made to pass as far as the staff, we must open the sinuses as far as the first instrument goes, and then search for the continuation of the passage, for the purpose of laying it open.

Having divided the fistula, as far as their termination, in the urethra, a catheter should be introduced, and worn at first, almost constantly. This is better than a bougie, which must be frequently withdrawn to allow the patient to make water, and it often could not be introduced again without getting entangled in the wounds.

Whatever instrument is used for keeping the passage clear and open, while the sores are healing, whether the sores are the consequence of the causes of the fistula, or the above operation, there is, in many cases, a limited time for its employment. At first, it often assists the cure; but, in the end, it may obstruct the healing, by acting at the bottom of the wound, as an extraneous body. Hence when the sores become stationary, let the catheter be withdrawn, and introduced only occasionally.

Even after the sores are well, the bougie may afterwards be used, in order to determine whether the passage is free from disease.

When fistula in perinæo have been

laid open, the wounds are to be at first dressed down to the bottom as much as possible, which will prevent the reunion of the parts first dressed, and make the granulations shoot from the bottom, so as to consolidate the whole by one bond of union. (See *Treatise on the Venereal Disease*, by John Hunter.) Additional observations upon this subject, and, in particular, the opinions of Desault concerning it, will be found in the article, *Urinary Abscesses and Fistule*.

FISTULA SALIVARY. (See *Parotid Duct*.)

FLUCTUATION. (from *fluctuo*, to float.) The perceptible motion communicated to any collection of purulent matter or other kind of fluid, by applying some of the fingers of each hand, at a certain distance from each other, to the surface of the tumour, and pressing with them alternately, in such a manner, that the fingers of one hand are to be employed in pressing, while those of the other hand remain lightly placed on another part of the swelling. When the ends of one set of fingers are thus delicately applied, and the surgeon taps, or makes repeated pressure with the fingers of the other hand, the impulse, given to the fluid, is immediately perceptible to him, and the sensation, thus received, is one of the principal symptoms, by which practitioners are enabled to discover the presence of fluid in a great variety of cases. Great skill in ascertaining by the touch the presence of fluid in parts, or being enlued with the *tactus eruditus*, as it is termed, distinguishes the man of experience as remarkably, perhaps, as any quality that can be specified.

When the collection of fluid is very deeply situated, the fluctuation is frequently exceedingly obscure, and sometimes not at all distinguishable. In this circumstance, the presence of the fluid is to be ascertained by the consideration of other symptoms. For example, in cases of hydrops pectoris and empyema, surgeons do not expect to feel the undulation of the fluid in the thorax with their fingers; they consider the patient's difficulty of breathing, the uneasiness attending his lying upon one particular side, the œdema of the parietes of the chest, the dropsical affection of other parts, the more raised and arched position of the ribs on the affected side, the preceding rigors, fever, and several other circumstances, from which a judgment is formed, both with regard to the presence and the peculiar nature of the fluid.

FOMENTATION. (*Fomentatio*, *Fomentum*, *Fotus*.) By a fomentation, surgeons commonly mean the application of

flannel or some other substance, wet with warm water, or some medicinal decoction, to any part of the body. Fomentations are chiefly of use in surgery in relieving pain, and inflammation, and in promoting suppuration, when this is desirable. Some particular decoctions, however, are used for fomentations, with a view of affecting by means of their medicinal qualities, scrofulous, cancerous, and other sores of a specific nature. We shall just mention a few of the most useful fomentations in common use.

FOMENTUM AMMONIÆ MURIATÆ. *R.* *Fomenti Communis* ℥ij. *Ammon. Mur.* ℥j. *Spirit. Camph.* ℥ij.

Just before using the hot decoction, add to it the ammonia muriata, and spirit. Said to be of service to some indolent ulcers; and, perhaps, it might be of use in promoting the absorption of some tumours, and suppuration in others.

FOMENTUM CICUTÆ. *R.* *Fol. Cicut. recent.* ℥ij. *vel Fol. Cicut. exsiccat.* ℥ij. *Aq. Comm.* ℥ij. *Coque usque reman.* ℥ij. *et cola.*

This fomentation is considered, as a very proper one for many scrofulous, cancerous, and phagedenic ulcers.

FOMENTUM CHAMÆMELI. *R.* *Lini contusi* ℥j. *Chamæmeli* ℥ij. *Aq. Distillat.* ℥vj. *Paulisper coque, et cola.*

This is a common fomentation, for ordinary purposes.

FOMENTUM GALLÆ. *R.* *Gallæ Contusæ* ℥ss. *Aq. Ferventis* ℥ij. *Macera per horam, et cola.* Used for the prolapsus ani. It is sometimes also employed, as a cold application, in cases of hemorrhoids.

FOMENTUM PAPAVERIS ALBI. *R.* *Papav. Alb. Exsiccati* ℥iv. *Aq. Pur.* ℥vj. Bruise the poppies, put them in the water, and boil the liquor, till only a quart remains, which is to be strained. This fomentation is a very excellent one, for very painful inflammations of the eyes, and for numerous ulcers, and other diseases, attended with intolerable pain.

FONTANELLA. (dim. of *fons*, a fountain.) An issue, so named from its continually running. (See *Issue*.)

FONTICULUS. (dim. of *fons*, a fountain.) An issue, so named from its continually running. (See *Issue*.)

FORCEPS, is an instrument much employed in surgery for a variety of purposes, and having accordingly various constructions. The general design, however, of every surgical forceps is to take hold of substances, which cannot be conveniently grasped with the fingers; and, of course, the instrument is always formed on the principle of a pair of pincers, having two blades, either with, or without

handles, according to circumstances. The smallest forceps is that which is employed in the operation of extracting the cataract, and which is useful for removing any particles of opaque matter from the pupil, after the chief part of the crystalline lens has been taken away.

Another forceps, of larger size, is that used for taking up the mouths of the arteries, when these vessels require the ligature, in cases of hemorrhage. This instrument is also frequently employed for taking dressings off sores, removing pieces of dead bone, foreign bodies from wounds, and, particularly, for raising the fibres, which are about to be cut, in all operations, where careful dissection is required. This forceps resembles that, which is contained in every case of dissecting instruments, and is often called the *artery*, or *dissecting* forceps, from its more important uses.

Neither of the foregoing forceps is made with handles; each opens by its own elasticity; and the ends of the blades only come into contact, when pressed together by the surgeon.

The following kinds of forceps are constructed with handles, by means of which they are both opened and shut.

1. The common forceps, contained in every pocket case of surgical instruments, and used for removing dressings from sores, extracting dead pieces of bone, foreign bodies, &c.

2. Larger forceps, employed for extracting polypi.

3. Forceps of different sizes and constructions, used in the operation of lithotomy, for taking the stone out of the bladder, or for breaking the calculus, when it is too large to be extracted in an entire state.

FRACTURE. (from *frango*, to break.) Is a solution of continuity of one, or of several bones, produced in general by external force, but, occasionally, by the powerful action of muscles, as is often exemplified in the broken patella. The long bones are particularly subject to be broken, and, mostly, at their middle part. They may, however, be fractured near their extremities. Sometimes, the same bone is broken in different places, which case is termed a *comminuted* fracture.

Though, when the middle part of a bone is fractured, the ends of the fracture are more apt to be displaced, on account of the contiguous surfaces being less extensive yet, this kind of fracture is the least dangerous, because the violence, which has caused the accident, has seldom been applied to the broken part, and consequently, the adjacent soft parts are

uninjured. The middle of a bone also is broken by less force, than any other part of it, and the fracture being distant from any joint, no stiffness, nor anchylosis, is likely to result from the injury.

Fractures are also distinguished into *transverse* and *oblique*. Duverney has admitted another class, viz. *longitudinal* ones; but, J. L. Petit has denied the possibility of this case, and Boyer, adopts the opinion of the latter, rejecting, as impossible, the longitudinal fracture, unless that name be given to longitudinal splinters of comminuted fractures. M. Louis positively rejected the possibility of longitudinal fractures, since, he thought, that they could not happen, without the bone being at the same time fractured obliquely and transversely. The following case is related by M. Levéillé, in order to shew, that longitudinal fractures are possible. Circumstances made it necessary for him to amputate the thigh of an Austrian soldier, who was put under his care in the year 1800, in consequence of being struck with a ball in the lower third of the leg at the battle of Marengo. The soldier had walked several miles, after receiving the injury, before he arrived at Pavia. The wound appeared simple and likely to heal, as soon as the injured portion of the tibia had exfoliated. The event turned out otherwise, and the thigh was amputated.

M. Levéillé has preserved the tibia, upon which the impression of the ball may be distinguished, and, from this point, run several longitudinal and oblique lines, which extend from the lower third towards the upper head of the tibia. These are fissures, which interest the whole thickness of the parietes of the medullary canal. They have been acknowledged to be so by the professors, Dubois, Chauffrier, Duméril, Deschamps, and Roux, who were appointed by the Ecole De Médecine to enquire into the fact. (*Levéillé, Nouvelle Doctrine Chirurgicale, Tom. 2, p. 158.*)

The most important division of fractures, is into *simple* and *compound*. By a *simple* fracture, surgeons mean a breach in the continuity of one, or more bones, without any external wound, communicating internally with the fracture, and caused by the protrusion of the ends of the broken bone, or bones. By a *compound* fracture, they signify the same sort of injury of a bone, or bones, attended with a laceration of the integuments, which laceration is produced by the protrusion of one, or both ends, of the fracture.

The dangerous nature of compound

fractures will be fully understood, when we presently treat separately of this subject.

The causes of fractures are divided into *predisposing* and *remote*.

In the first class are comprehended, the situation and functions of the bones, the age of the patients, and their diseases. Superficial bones are more easily fractured, than those, which are covered by a considerable quantity of soft parts. The functions of some bones render them more liable to be fractured, than others; thus the radius, which supports the hand, is more liable to be fractured, than the ulna. The clavicle, which serves to keep the shoulder in its proper position, and support on its arched extremity all the motions of the upper extremity, is hence very subject to be broken. The gradual increase of the quantity of the phosphate of lime, in the structure of the bones, makes them brittle, in proportion as we advance in years, and, in old age, the proportion of the inorganized to the organized part is so great, that the bones are fractured by the slightest causes. In childhood, the fibrous and organized part bears a greater proportion to the earth, and the bones being consequently, more elastic and flexible, are not so easily broken, as in old age.

Lues venerea, arthritis, cancer, rachitis, scurvy, and scrofula, says M. Levéillé, predispose to fractures. B. Bell mentions two venereal patients, of whom the hardest and largest bones were completely broken by the ordinary action of the muscles of the limb. Fabricius Hildanus quotes from Sarrazin, a physician of Lyons, the case of a gouty patient, sixty years of age, who, in putting on his glove, broke his arm; the fracture having been ascertained, three days afterwards, to be situated above the elbow. Desault used often to speak of a nun of Salpêtrière, whose arm was broken, as a person was handing her out of a carriage. M. Louis, who was vexed, that no union took place, was not a little surprised to find her thigh bone experience the same fate, one day as she was changing her posture in bed. It was then that M. Louis learned, that this lady had a cancer in her right breast. M. Levéillé assures us, that he has observed similar cases in the Hôtel Dieu.

According to this last writer, the history of two girls is related by Buchner, one of whom died rickety at the age of sixteen, having broken the femur a short time before her death; and the other, after taking the breast very well for two years, and thriving for a time, became affected with rachitis, and met with the same accident as she was merely running

along in the street. (*Nouvelle Doctrine Chirurgicale*, Tom. 2, p. 163.)

Many extraordinary instances of fractures from a morbid softness and fragility of the bones are upon record. Suffice it here, to refer to the Philosophical Transactions; Mém de l'Acad. Royale des Sciences; Act. Hafniens; German Ephem.; Gooch's Chirurgical Works, Vol. 2; Saviard's Observations Chirurgicales, p. 274, &c. (See also *Fragilitas* and *Mollities Ossium*.)

On the subject of fractures, produced by the scurvy, Levéillé recommends us to peruse Marcellus Donatus; Saviard's Observations; Heyne de Morbis Ossium; Poupart's Works inserted in the Mém. de l'Acad. de Sciences, 1699; and the Treatise published at Verona, in 1761, by Jean de Bona.

Paré, Platner, Callisen, and several other writers, have set down cold, as a predisposing cause of fractures. This doctrine has originated from these injuries being more frequent in the winter time, and is quite erroneous, since, in cold countries, the greater number of falls, which happen in the winter, is a circumstance, that fully explains why fractures are then more common, than in summer.

The remote cause of fractures is external force, variously applied, in falls, blows, &c. In particular instances, the bones are broken by the violent action of the muscles attached to them; this is almost always the case with the fractured patella. The olecranon and os calcis have likewise been broken by a violent contraction of the muscles, inserted into them. With respect to the heel, Petit records two instances, one of which was communicated to him by Poncelet, and the other seen by himself in Madame La Presidente de Boissire, who met with the accident in walking a gentle pace in the court of the Hôtel de Soubise. When injury happens in leaping, or falls from a high situation, M. Levéillé thinks it more probable, that a portion of the os calcis is torn off by the powerful action of the muscles of the calf, than that it is broken by any blow immediately on the part. He states, that Desault used frequently to cite two examples of this kind, one of which is recorded in his *Œuvres Chirurgicales*.

Whether the long bones can be fractured by the mere action of the muscles, has been an unsettled point. In the Philosophical Transactions, a fracture of the humerus is ascribed to this cause, and M. Botentuit has seen the same accident happen in striking a shuttlecock with a battledore. According to M. Debeaumarchef, as a man was descending a lad-

der at a quick rate, his heel got entangled in an opening, and he made a violent exertion to avoid falling. The consequence was a fracture of the lower third of the leg. Curet informs us, that a cabin-boy, aged seventeen, made a considerable effort to keep himself from being thrown down by the rolling of the ship, as he was making water. The femur was fractured by the powerful action of the muscles of the thigh. The lad had no fall, and, with some difficulty, supported himself on the other limb, till he received assistance.

We are told, says M. Levéillé, by Poupée Desportes, that a negro, about twelve or thirteen years old, was seized with such violent spasmodic contractions of the muscles of the lower extremities, that the feet were turned backward, and the neck of each thigh bone was fractured, the ends of the broken bones also protruding through the skin upon the outside of the thigh. A cure was effected, after an exfoliation. We read, also, in the *Mélanges des Curieux de la Nature*, that during a fit of epilepsy, a child, ten years old, had its left humerus and tibia broken, and, that upon opening the body, other solutions of continuity were observed. Doctor Chambers recollects having assisted, at his father's house, in dressing a child, eleven or twelve years old, that had broken the humerus in throwing a stone, a considerable distance. (*Levéillé Nouvelle Doctrine Chirurgicale, Tom. 2, p. 164—166.*)

For my own part, making all due allowance for the inaccuracy of some of the reports made by writers, I think the possibility of the long bones being broken by the violent action of the muscles, is sufficiently proved. I have never seen but one example of the occurrence; but it was a very unequivocal one. I once attended at Pentonville, for Mr. Ramsden, an exceedingly strong man, who broke his os brachii in making a powerful blow, although he missed his aim, and struck nothing at all. The whole limb was afterwards affected with vast swelling and inflammation. This man, I remember, was occasionally seen by Mr. Welbank, of Chancery-lane.

Some of the symptoms of fractures are very equivocal. The pain, and inability to move the limb, commonly enumerated, may arise from a mere bruise, a dislocation, or other cause. The crepitus, the change in the form of the limb, and the shortening of it, are circumstances, communicating the most certain information; and the crepitus, in particular, is the principal symptom to be depended upon. The signs of fractures, however, are so exceedingly various, according to the bones, which are the subject of injury, that, it

cannot be said, that there is any one, which is invariably attendant on such cases, and characteristically confined to them. The writers of systems of surgery have usually noticed loss of motion in the injured limb, deformity, swelling, tension, pain, &c. as forming the general diagnosis of fractures. However, it is easily comprehensible by any one, acquainted with anatomy, that numerous fractures cannot prevent the motion of the part, nor occasion outward deformity; and every surgeon must know, that, though, at first, there may be pain in the situation of a fracture, no swelling and tension take place, till after a certain period.

When, therefore, a limb is broken, and the event is not manifest from the distortion of the part, it is proper to trace, with the fingers, the outlines of the suspected bone; if it be the tibia, let the surgeon examine with his fingers, whether there is any inequality along the anterior surface, and along the sharp front edge of that bone. If it be the clavicle, let him trace the superficial course of the bone, in the same attentive manner. Wherever any unusual pain occurs, or any unnatural irregularity appears, then let him try, if a grating, or crepitus, cannot be felt on endeavouring to make one end of the fracture rub against the other. When the os brachii, or the os femoris, is the subject of enquiry, a crepitus is felt almost as soon as the limb is touched, and, in the case of the broken thigh, there is a considerable shortening of the extremity, unless sometimes when the fracture is of the transverse kind. But, when there are two bones, as in the leg and the forearm, and only one is broken, the other continues to prevent the limb from being shortened, and thrown out of its natural shape, so that a crepitus can only be felt by a very careful examination with the fingers.

I am aware, that considerable harm, and great unnecessary pain, have been occasioned in the practice of surgery, by an over-officious care to feel the grating of fractured bones, and, whenever the case is sufficiently evident in the eyes, I cannot refrain from censuring those practitioners, who indulge their own ill-judged habits, at the expence of torture to the unfortunate patient. A fracture is an injury, that is necessarily attended with a great deal of pain, and followed by more, or less swelling, and inflammation; and to increase these evils by roughly, or unnecessarily handling the part, is both ignorantly cruel, and, if I may use the expression, unsurgical.

In some kinds of fractures, the broken bone is so surrounded with thick fleshy

parts, that it is very difficult to feel a crepitus, or ascertain the existence of the injury. Some fractures of the neck of the thigh bone, unattended with much retraction of the limb, are instances illustrative of this observation.

The prognosis of fractures varies, according to the bone injured, what part of it is broken, the direction of the breach of continuity, and what other mischief complicates the case. Fractures of bones, which have many strong muscles inserted into them, are more difficult of cure, than those of other bones, which have not so many powers attached to them, and capable of disturbing the ends of their fractures.

The fracture of the middle part of a long bone, is less dangerous, than a similar injury near a joint, with which the bone is articulated, for reasons mentioned above.

Oblique fractures are more troublesome, and difficult of cure, than transverse ones, because an oblique surface does not resist the retraction of the lower portion of the broken bone, and consequently, it is very difficult to keep the ends of the fracture applied to each other, in a proper manner.

Fractures complicated with a violent contusion of the soft parts, or with a wound, rendering them compound ones, are much more dangerous, than other ones free from such accidents. Fractures of the leg are generally more serious, than similar injuries of the upper extremity.

A fracture may be rendered a very dangerous case, by being attended with a wound of a large artery.

In a debilitated old man, a fracture is less likely to end well, than in a healthy child, or strong young subject. The scurvy is said to retard the formation of callus; but, it is not true, that pregnancy prevents the union of fractures. Some years ago, I attended for Mr. Ramsden, a woman, in a court leading out of St. Paul's Church-yard, who broke both bones of her leg, when she was several months gone with child. Her pregnancy, however, did not appear to be at all unfavorable to the cure, as she got quite well in the usual time. "It is not generally settled," says a modern writer, "whether pregnancy should be accounted a complication. I have seen, with some practitioners, a pregnant woman get well of a simple fracture in the ordinary time." (*Levéillé, Nouvelle Doctrine Chirurgicale, Tom. 2, p. 159.*) And, in another place, he says, "*Contre l'opinion de Fabrice de Hilden, l'expérience m'a prouvé que, chez les femmes grosses, le cal était aussi prompt à*

se former, que chez toute autre personne." (*Op. cit. Tom. 2, p. 172.*) There are certain indescribable constitutions, in which bones, more particularly, however, the os brachii, will not unite again after being broken. These temperaments are also very various; at least, I infer so from two subjects, to whom I paid particular attention. One was a strong, robust man, whose chief peculiarity seemed to be his indifference to pain: he had the ends of the broken os brachii cut down to, turned out, and sawn off, by Mr. Long, in St. Bartholomew's hospital, and the limb afterwards put in splints, and taken the greatest care of; but no union followed. The other case was a broken tibia and fibula, which remained disunited for about four months; but, afterwards, grew together. The latter subject was a complete instance of hypochondriasis. I have since seen a woman, under Sir James Earle, in the above situation, whose os brachii did not unite in the least, though it had been broken several months. Every attempt to move the bone occasioned excruciating torture. The woman died of some illness in the hospital, and, on dissecting the arm, the cause of the fracture not having united, was found to arise from the upper, sharp, pointed extremity of the lower portion of the broken bone having been forcibly drawn up by the muscles, and penetrated the substance of the biceps, in which it still remained. I am indebted to Mr. Henry Earle for the account of the appearance on dissection. and I do not know, that this kind of impediment to the union of a fracture has been noticed by any writer, except Mr. Charles White, who appears to have conceived the possibility of the occurrence, (*Cases in Surgery, p. 70. Edit. 1770.*)

The causes of fractures remaining disunited, will, according to Richerand, be found to depend, either upon the broken ends of the bone not being properly in contact; upon the limb having been moved too much; upon the advanced age of the patient; or, upon the general inertia of the solids, and languor of the vital properties. (*Nosographie Chirurgicale, Tom. 3, p. 37 Edit. 2.*)

It is observed by M. Larrey, that the gunshot wounds of the extremities, complicated with fracture, especially with that of the humerus, received by the soldiers of the French army in Syria, were almost all followed by the formation of accidental joints. The two fragments of the broken bone continued moveable, their asperities and projecting angles having been destroyed by friction, and their ends being rounded and covered with a cartilaginous substance, so as to facilitate the

motions, which the patients executed in various directions, in an imperfect manner, and without pain. M Larrey acquaints us, that many invalids were sent back to France with such infirmity.

"I ascribe," says he, "the causes of these accidental articulations :

"1. To the continual motion, to which the wounded soldiers were exposed, after their departure from Syria, till their arrival in Egypt, in consequence of their having been obliged either to walk this journey on foot, or to be carried it on beasts.

"2 To the bad quality of the food, and the brackish water, which the men were under the necessity of drinking in this painful journey.

"3. To the quality of the atmosphere of Syria, almost entirely destitute of vital air, and impregnated with pernicious gases, issuing from the numerous marshes, near which, we were a long while stationed.

"All these causes may have prevented the formation of callus, either by diminishing the quantity of the phosphate of lime, or moving the bones out of that state of coaptation, in which they should constantly lie, in order to unite.

"Bandages, embrocations, rest, and regimen, proved quite ineffectual."—(Larrey. *Mémoires de Chirurgie Militaire*, Tom. 2, p 131, 132.)

Here I believe it will be as well to consider at once the treatment of the preceding cases.

The diversity of the causes, which may be concerned in preventing the union of fractures, plainly shews, that the treatment should also be different in different cases.

When the want of union is ascribed to the ends of the fracture not being in a state of coaptation, and to their having been moved about too frequently, the obvious indications are, to set the fracture better, and to take adequate measures for keeping its extremities in contact and perfectly motionless.

When the advanced age of the patient seems to be the cause of the union not taking place, the application of the proper apparatus is to be continued a considerable time, since experience proves, that in old subjects, the cure of fractures often requires many months. In such examples, also, tonic and cordial medicines, with a nutritive diet, are highly proper.

When several months have elapsed since the accident, and there is reason to apprehend, that a preternatural joint is formed, a variety of plans have been proposed and practised.

The most ancient method of treatment is that of forcibly rubbing the ends of the fracture against each other, so that the irritation may make them inflame, and take on a disposition to form callus.

This plan was recommended by the late Mr. John Hunter, and has had the approbation of many other distinguished modern practitioners. Mr. Hunter used even to advise us, in the case of a disunited fracture of the leg, or thigh, to let the patient get up, and attempt to walk with the splints on the limb, so that the requisite irritation might be produced.

The idea of exciting a degree of inflammation in the situation of the fracture, certainly appears exceedingly rational, and, I believe, the practice has been attended with a degree of success. Mr. White records an example, in which he cured a broken thigh on this principle, a strong leather case having been made for the limb. (*Cases in Surgery*, p. 75.) The method is spoken of in Celsus: *si vetustas occupavit, membrum extendendum est, ut aliquid lædatur: ossa inter se manu dimovenda, ut concurrendo exasperentur, et ut si quid pingue est, eradatur, totumque id quasi recens fiat; &c.*

The foregoing treatment, however, is only likely to answer, before a new joint is completely formed, and, when the limb has hitherto been kept entirely motionless.

When the case is old, and there is every cause for believing, that the fracture has been completely converted into a preternatural articulation, we have been advised to cut down to the ends of the bone, rasp or saw them off, and then treat the limb, just as if the case were a recent compound fracture.

This bold practice was first suggested by Mr. Charles White: "Robert Elliot, of Eyham, in Derbyshire, a very healthy boy of nine years old, had the misfortune, about midsummer, in the year 1759, by a fall, to fracture the humerus, near the middle of the bone. He was immediately taken to a bone-setter in that neighbourhood, who applied a bandage and splints to his arm, and treated him as properly," says Mr. White, "as I suppose he was capable of for two or three months. His endeavours, however, were by no means productive of the desired effect, the bones not being at all united. A surgeon of eminence, in Bakewell, was afterwards called in; but as he soon found he could be of no service to him, and as the case was very curious, he advised the lad's friends to send him to the Infirmary at Manchester. He was accordingly brought thither the Christmas following, and admitted an in-pa-

tient. Upon examination we found it to be a simple oblique fracture, and, that the ends of the bone rode over each other: his arm was become not only entirely useless, but even a burthen to him, and not likely to be otherwise, as there was little probability that it could ever unite, it being now six months since the accident happened.

"Amputation was therefore proposed as the only method of relief; but I could not give my consent to it, for as the boy was young, and had a good constitution, it was hardly possible that it could be owing to any fault in the solids or fluids, but that either nature was disappointed in her work by frequent friction, while the callus was forming, or rather that the oblique ends of the bone, being sharp, had divided a part of a muscle, and some portion of it had probably insinuated itself betwixt the two ends of the bone, preventing their union. Whichever of these might be the case, I was of opinion," continues Mr. White, "that he might be relieved by the following operation, viz. by making a longitudinal incision down to the bone, by bringing out one of the ends of it, which might be done with great ease as the arm was flexible, and cutting it off, either by the saw or cutting-pincers, then by bringing out the other, and cutting off that likewise, and afterwards by replacing them end to end, and treating the whole as a compound fracture.

"The objections made by the other gentlemen concerned, to this proposal, were, first, the danger of wounding the humeral artery by the knife. Secondly, the laceration of the artery by bringing out the ends of the bones. And, thirdly, that we had no authority for such an operation. As to the first, that was easily obviated, by making the incision on the side of the arm, opposite to the humeral artery. The place of election appeared to me to be at the external and lower edge of the deltoid muscle, as the fracture was very near to the insertion of that muscle into the humerus; the danger of wounding the vessel not only being by that means avoided, but, after the operation, while the patient was confined to his bed, the matter would be prevented from lodging, and the wound be easily come at, to renew the dressings. The second objection will not appear to be very great, when we consider that in compound fractures the bone is frequently thrust with great violence through the integuments, and seldom attended with laceration of any considerable artery; and as this would be done with great caution, that danger would appear very trifling. The third and last objection is no

more than a general one to all improvements.

"This method which I have been proposing," proceeds Mr. White, "was at last resolved upon, and I assisted in the operation, which was performed, by a gentleman of great abilities in his profession, on January 3, in the present year (1760.) The patient did not lose above a spoonful of blood in the operation, though the tourniquet was not made use of. When the operation and dressings were finished, the limb was placed in a fracture-box, contrived on purpose, the lad confined to his bed, and the rest of the treatment was nothing different from that of a compound fracture.

"The wound was nearly healed in a fortnight's time, when an erysipelas came on, and spread itself all over the arm, attended with some degree of swelling; this by fomentations, and the antiphlogistic method, soon went off, and the cure proceeded happily, without any other interruption. In about six weeks after the operation, the callus began to form, and is now quite firm. The arm is as long as the other, but somewhat smaller, in consequence of such long continued bandages; he daily acquires strength in it, and will soon be fit to be discharged." (*Cases in Surgery, by Charles White, F. R. S. p. 69, &c.*)

In another instance of a broken tibia, which continued disunited an extraordinary length of time. Mr. White practised an operation, somewhat similar to the foregoing one, with complete success. He made a longitudinal incision, about four inches in length, through the integuments, which covered the fracture. By the application of a trephine, he cut off the upper end of the bone, and as the lower end could not be easily sawn off, he contented himself with scraping it. In the course of the subsequent treatment, he had occasion to take off, with the cutting-pincers, a small angle of tibia, and to touch the lower part of the bone with the butter of antimony, as well as to introduce the same caustic between the extremities of the fracture, in order to destroy a substance, which intervened. A trifling exfoliation followed. In twelve weeks, the bone was firmly united. (*Op. cit. p. 81, 82*.)

Besides Mr. White's cases, there are now some other instances, upon record, where the operation, which he has proposed, has succeeded. One is related by Mr. Rowlands, of Chester: the operation was done for the cure of a fractured thigh, which had lost all disposition to unite. (*See Medico-Chirurgical Transactions, Vol. 2, p. 47.*)

M. Vignerie, principal surgeon of the Hôtel Dieu, at Toulouse, has also practised Mr. White's operation with success. (See *Larrey's Mémoires de Chirurgie Militaire*, Tom. 2, p. 132.)

On the other hand, the operation has frequently failed. In the instance, in which I saw it executed on the humerus by Mr. Long, in St. Bartholomew's Hospital, it did not answer, though the ends of the bone were most fairly sawn off, and the case treated with particular care and skill. Besides this example, I have heard of others, in which Mr. Cline and other practitioners have tried the experiment with no better success.

What is still more discouraging is, that the operation has sometimes proved fatal. (See *Richerand's Nosographie Chirurgicale*, Tom. 3, p. 39. Edit. 2. *Larrey's Mémoires de Chirurgie Militaire*, Tom. 2, p. 132.)

A modern proposal has lately been suggested: namely, to pass a seton through the new joint, with a view of exciting inflammation, and bringing about an union of the ends of the bone. This practice originated with a surgeon of Philadelphia, who has published an example, in which it succeeded. A Monsieur Rigal is likewise stated to have tried this plan in one instance with success: the callus formed, after the local irritation had been kept up for a month, by means of the seton. (See *Levéillé Nouvelle Doctrine Chirurgicale*, Tom. 2, p. 201.)

The process, by which broken bones grow together again, is nearly of the same nature as that, by which the soft parts are united in wounds. The only difference is, that in uniting a fracture, the vessels after a time deposit the phosphate of lime. The vessels, ramifying on the ends of the fracture, first effuse coagulating lymph. This gradually becomes vascular, and, in proportion as the vessels acquire the power of secreting cartilaginous matter, it is by degrees converted into new bone, termed *callus*, which, from being at first soft and flexible, at length becomes firm and unyielding, like the original bone, and fit for constituting the future bond of union, between the two extremities of the fracture. In order that the first connecting substance may speedily become organized, and fitted for the formation of callus, nothing is so favourable as perfect quietude. Hence, the chief surgical indication, in the treatment of fractures after the bones are replaced, is to keep them perfectly motionless; nature completes the rest. (See *Callus*.)

TREATMENT OF FRACTURES IN GENERAL.

The general doctrine, relative to frac-

tures, is contained under the following heads, as part of the treatment of them.

Extension.

Counter-Extension.

Coaptation, or Setting.

Application of Medicaments.

Deligation, or Bandage.

Position.

Prevention, or Relief of Accidents.

In the subsequent section of the present article, little more remains for us to do, than to follow Mr. Pott in his judicious observations on this part of practice.

It is very material to understand, how the ends of a fracture become displaced, because the greatest object in the treatment is to prevent such derangement. The separation of the ends of the fracture, is not, however, an invariable occurrence; for fractures frequently take place, and yet no deformity is produced. When the tibia alone is fractured at its upper part, the shape of the limb is unaltered, because the diameter of the bone there is so great, and the surfaces of the fracture in contact so extensive, that they cannot be easily separated, and the unbroken fibula also aids in keeping the ends of the fracture from being displaced. A fracture of the upper thick part of the ulna alone is seldom deranged. In cases, however, in which both bones of the leg, or fore-arm, are broken, the ends of the fracture are commonly more or less displaced, and the limb consequently deformed.

The causes, and the varieties, of the derangement, attendant on fractures, form a most interesting subject.

In transverse fractures, the ends of the broken part cannot be deranged in the longitudinal direction, before they have been so much displaced, in the direction of the diameter of the bone, that no points of the fractured surfaces remain in contact.

But, when the fracture is oblique, and the surfaces not extensive, the derangement may happen in the direction of the axis of the bone, and the limb be shortened.

The third way, in which a fracture may be displaced, has not been much attended to; it is when the portions of the broken bone form an angle one with the other. In comminuted fractures this is most common; but, it also occurs both in simple fractures of the leg and thigh, when the foot is too much elevated, or depressed.

The fourth species of derangement is produced by a rotation of the inferior fractured portion on the superior, as is very common in fractures of the thigh.

The bones being only passive instruments of loco-motion, possess not, in their own organization, any cause of the change of situation, which takes place, but yield to exterior causes, to the weight of the member, and to muscular contraction. The force producing the fracture may, in some instances, not merely break the bone, but, also, displace the ends of the broken part.

Of all the causes, however, which tend to separate the ends of a fracture from each other, the action of the muscles, is the most important, and difficult to counteract.

Mr. Pott, after censuring the violent extension, and counter-extension, indiscriminately practised and recommended by the old surgeons, proceeds to enquire, whence arose the evils and difficulties formerly encountered. "Neither extension, nor counter-extension, says he, can ever be necessary on account of the mere fracture, considered abstractedly. The broken ends of the bone, or bones, are of themselves inactive, and, if not acted upon by other parts, they would always remain motionless. When any attempt is made to put them into motion, they of themselves can make no possible resistance; nor can any be made on their part, save an accidental one arising from the points of the fracture being entangled with each other; and when they have been once, by the hand of the surgeon, placed properly and evenly with regard to each other, they would of themselves for ever remain so. What then is the reason why fractured bones always suffer a greater or a less degree of displacement? why is a broken limb almost always shorter than its fellow? what creates the resistance which we always find in attempting to bring the fractured parts aptly together? whence does it proceed, that when we have done all that is in our power (according to this mode of acting) the ends of the fracture will, in many cases, become again displaced, and lameness and deformity frequently ensue? In short, what are the parts or powers which act on the bones, and which, by so acting on them, produce all these consequences?

"These parts are the muscles, the only moving powers in an animal body. By the action of these on the bones, all loco-motion is performed, and cannot be performed without them; and although all bones, when broken, are in some degree displaced and shortened, yet it will always be found, that in proportion as the muscles surrounding, or in connexion with a bone, are strong or numerous, or put into action by inadvertence or spasm, so will the displacement of the ends of

such bone, when fractured, be. The even and smooth position of the fractured ends of a tibia, when the fibula of the same leg is entire and unhurt; that is, when the muscles therefore cannot act upon the former; the visible and immediate deformity, when both the before-mentioned bones are broken nearly in the same place; that is, when the muscles can act upon, and displace such fracture; the great difficulty frequently met with, in endeavouring to get a broken os femoris to lie even tolerably smooth, and to prevent such broken limb from being much shorter than the other, are, among others which might be produced, such strong, and irrefragable proofs, as need no comment.

"From the muscles then, and from them only, proceeds all the difficulty which we meet with in making our extension; and by the resistance of these, and of these only, are we prevented from being always able to put the ends of a fractured bone immediately into the most apt contact.

"Let us in the next place consider, what it is which gives to a muscle, or to the principal muscles of a limb, the greatest power of resisting any force applied to them *ab externo*, in order to draw them out into greater length; for whatever that is, the same thing will be found to be the cause of the different degrees of resistance in setting a fracture.

"Does not the putting the muscles in a state of tension, or into a state approaching nearly to that of tension, almost necessarily produce this effect? or, in other words, does not that position of a limb, which puts its muscles into, or nearly into such a state, give such muscles an opportunity of exerting their greatest power, either of action, or of resistance? This I believe cannot be denied. On the other hand, what is the state or position of a muscle which is most likely to prevent it from acting, and to deprive it of most of its power of resistance; or what is that position of a limb which, in the case of a broken bone, will most incapacitate the muscles from acting on, and displacing it; and in the greatest degree remove that resistance which they have it in their power to make to the attempts for the reduction of such fracture? Is it not obvious, that putting a limb into such position as shall relax the whole set of muscles, belonging to, or in connection with, the broken bone, must best answer such purpose? Nothing surely can be more evident. If this be granted, will it not, must it not follow, that such posture of a broken limb must be the best for making the reduction; that is, it

must be that in which the muscles will resist the least, and be least likely to be injured; that in which the broken bone will be most easily set, the patient suffer least pain in present, and that from which future lameness and deformity will be least likely to happen. A little attention to what frequently occurs, may perhaps serve to illustrate and confirm this doctrine better than mere assertion.

"What is the reason why no man, however superficially acquainted with his art, ever finds much trouble in setting a fractured os humeri, and that with very little pain, and a very small degree of extension? Is it not because both patient and surgeon concur in putting the arm into a state of flexion; that is, into such a state as relaxes all the muscles surrounding the broken bone? and is it not for the same reason that we so very seldom see (comparatively speaking of this bone with others) a deformity in consequence of a fracture of it? Let the reduction be attempted with the arm extended from the body, and the difficulty of setting will be much increased: let the arm be deposited in an extended straight position, and the fracture will be displaced and lie uneven.

"Apply the same kind of reasoning to the os femoris; that bone whose fracture so often lames the patient, and disgraces the surgeon.

"Will it not be more cogent, and more conclusive, in proportion as the muscles in connexion with this bone are more numerous and stronger? I would ask any man, who has been much conversant with accidents of this kind, what is the posture which almost every person (whose os femoris has been newly broken) puts himself into, in order to obtain ease, until he gets proper assistance? Do such people stretch out their limb, and place their leg and thigh straight, and resting on the calf and heel? I believe seldom or never. On the contrary, do not such people almost always bend their knee, and lay the broken thigh on its outside? and is not the reason, why this must be the most easy posture, obvious?

"From want of attention to, or from not understanding these few self-evident principles, many people permit their patients to suffer considerable inconvenience, both present and future.

"It is a maxim universally taught and received, that a fractured limb may be in such state as not to admit of the extension necessary for its being set; that is, if assistance be not at hand, when the accident happens; if they who bring the patient home, do it so awkwardly or rudely, as to bruise and hurt the part; if

from drunkenness, folly or obstinacy in the patient, it happens that the limb is so disordered that it is found to be much swollen, inflamed, and painful, it is allowed not to be in a state to admit extension.

"This, I say, is a general maxim, and founded upon very just principles; but what is the general practice in consequence of it? It is, to place the limb in an extended, straight position, to secure it in that, and then by proper means, such as fomentation, poultice, &c. to endeavour to remove the tension and tumour. Now, if it be considered, that the swollen, indurated, and inflamed state of the muscles, is the circumstance which renders extension improper, surely it must be obvious, that such position of the limb as necessarily puts these very muscles in some degree on the stretch, must be a very improper one for the accomplishment of what ought to be aimed at. Under this method of treatment, the space of time which passes in the removal of the tension, is sometimes considerable; so considerable, that a happy and even coaptation becomes afterwards impracticable; and then this accident, which nine times in ten is capable of immediate relief, is urged as an excuse for unnecessary lameness and deformity.

"How then are we to conduct ourselves in such circumstances? The nature of the complaint points out the relief. Extension is wrong; a straight position of the thigh or leg is a degree of extension, and a still greater degree of it in proportion as the muscles are in such circumstances as to be less capable of bearing. Change of posture then must be the remedy, or rather the placing the limb in such a manner as to relax all its muscles, must be the most obvious and certain method of relieving all the ills arising from a tense state of them: which change of posture will be attended with another circumstance of very great consequence; which is, that the bones may in such posture be immediately set, and not one moment's time be thereby lost; a circumstance of great advantage indeed! For, whatever may be the popular or prevailing opinion, it is demonstrably true, that a broken bone cannot be too soon put to rights; as must appear to every one who will for a moment consider the necessary state of the muscles, tendons, and membranes surrounding, and the medullary organs contained within, a large bone broken and unset; that is, lying in an uneven irregular manner. Can any truth be more clear, than that if the fracture, tension, and tumefaction be such, that the muscles cannot bear to be

stretched out in the manner necessary for setting the broken bone without causing great pain, and perhaps bringing on still worse symptoms, the more the position of that limb makes its muscles approach toward a state of tension, the less likely it must be that such symptoms should remit, and the longer it must be before the wished-for alteration can happen: and consequently, that while the accomplishment of such purpose is by every other means aimed at, the position of the limb ought most certainly to contribute to, and not to counteract it? In short, if the experiment of change of posture be fairly and properly made, the objections to immediate reduction, from tension, tumour, &c. will most frequently be found to be groundless; and the fracture will be capable of being put to rights, as well at first as at any distance of time afterwards."

For some criticisms on the foregoing remarks, relative to the relaxation of the muscles, in cases of fractures, the reader is referred to *Fractures of the Thigh*.

Mr. Pott next continues: "Extension having been made, and the broken ends of the bone having been placed as smooth and as even as the nature of the case will admit, the next circumstance to be attended to is the application of some medicament to the limb; particularly to the fractured part of it.

"The intention in applying any kind of external medicine to a broken limb is, or ought to be, to repress inflammation, to disperse extravasated blood, to keep the skin lax, moist, and perspirable, and at the same time to afford some, though very small degree of restraint or confinement to the fracture, but not to bind or press; and it should also be calculated as much as possible to prevent itching, an herpetic eruption, or an erysipelatous efflorescence. At St. Bartholomew's hospital, we use a cerate made by a solution of litharge in vinegar, which with soap, oil, and wax, is afterwards formed into such consistence as just to admit being spread without warming.

"This lies very easy, repels inflammation, is not adherent, comes off clean, and very seldom, if ever, irritates, or causes either herpes or erysipelas. But let the form and composition of the application made to the limb be what it may, one thing is clear, viz. that it should be put on in such manner, as that it may be renewed and shifted as often as may be necessary, without moving the limb in any manner: it being certain, that when once a broken thigh or leg has been properly put to rights, and has been deposited properly on the pillow, it ought not

ever to be lifted up or moved from it again without necessity, until the fracture is perfectly united; and it is true, that such necessity will not very often occur. This may perhaps seem strange to those who are accustomed to roll simple fractures, and consequently to lift them up every three or four days, in order to renew such kind of bandage: but the necessity of this motion arises merely from the kind of bandage made use of, and not from any circumstance of the fracture itself. That the frequent motion of a fractured limb cannot possibly contribute to the ease of the patient, will, I suppose, be readily admitted; as I suppose also it will, that when a broken limb has been once deposited in the best position possible, it is impossible to mind that position merely by taking such limb up and laying it down again; from whence it must follow, that such kind of apparatus as necessitates the surgeon frequently to disturb the limb, cannot be so good as one that does not; provided the latter will accomplish the same kind of cure as the former: the truth of which position will appear in the most satisfactory manner to any, who will take a view of the method, in which simple fractures are treated, at the before-mentioned hospital. Such application having been made as the surgeon thinks right, the next thing to be done is to put on a proper bandage—That used by the ancients, and by the majority of the present practitioners, is what is commonly called a roller. This is of different length, according to the surgeon's choice, or as it may be used in the form of one, two, or more pieces. Hippocrates used three; (see *Fab. ab Aquapendente, Wiseman, Scultetus, Hildanus, Petit, Duverney*;) Celsus s.x; but the present people seldom use more than one. By such kind of bandage three intentions are aimed at, and said to be accomplished, viz. to confine the fracture, to repress or prevent a flux of humours, and to regulate the callus, (see *Duverney*;) but whoever will reflect seriously on this matter, will soon be convinced, that although some sort of bandage is necessary in every simple fracture, as well for preserving some degree of steadiness to the limb, as for the retention of the applications, yet none, nor either of these three ends can be answered merely, or even principally, by bandage of any kind whatever: and therefore, if this should be found to be true, that is, if it should appear, that whatever kind of deligation be made use of, it cannot be a principal, but only an accessory kind of assistance, and that in a small degree, and very little to be depended upon, it will follow that such

kind of bandage as is most difficult to be applied with justness and exactitude, such as is soonest relaxed and out of order, such as stands most frequently in need of renewal, and, in such renewal, is most likely to give pain and trouble, must be more improper and less eligible, than one which is more easily applied, less liable to be out of order, and which can be adjusted without moving the limb.

"The ancient method of applying the roller, in case of simple fracture of the leg or thigh, was to make (see *Fab. ab Aquapendente*, and *Wiseman*.) four or five turns round the fracture first, and then to continue the bandage upward and downward, until the whole limb was enveloped properly. This was done in this manner with a double view; to keep the broken ends of the bone in their place, and to prevent the influx of humour. Modern practitioners, although they have the same ends in view, generally begin their bandage from the inferior extremity of the limb, and continue it up to the top. Whether the old or the later method be followed, whether one or more rollers be made use of, the whole is executed while the limb is kept, by means of the assistants, in the same extended posture in which the coaptation was made, so that the whole bandage is finished before the leg is deposited on the pillow; in the doing all which, if from the tired state of the surgeon, or either of his assistants, or if, from the awkwardness, or unhandiness of any of the parties concerned, the true and exact position of the limb be at all deviated from, the ends of the bone will again be in some degree displaced, and the bandage, instead of being of use, will become prejudicial, by pressing hard on the inequalities of the fracture: to which let me add, that the roller, especially when applied to a leg, if it be not put on with due dexterity, that is, if it does not sit perfectly smooth and even, is the most unequal and worst kind of bandage in use.

"These objections, however just, are not the least to which the roller in the case of simple fracture of the leg or thigh are liable; for, as I have already hinted, it must, in a very short space of time, even while the parts surrounding the fracture are in the most tender and most painful state, be renewed, and that more than once; which renewal cannot be executed without again taking the limb off from the pillow, again committing it to the hands of assistants, and again running a risk of displacing the fracture: all which, not to mention the repetition of pain to the patient every time such operation is

performed, and which must be at least every four or five days, are (as I have already said) very material objections to the roller, even in the most judicious and dexterous hands, and still more so in those of the rude and ignorant.

"The prevention of a flux of humours to a broken limb by bandage, is a common phrase: but they who use it have either no idea at all annexed to it, or a very erroneous one.

"If by the points and edges of the broken bone, the muscles and membranes be unavoidably wounded and torn, or if the same kind of mischief be incurred by the inadvertence or indiscretion of the patient, or of those who assisted in getting him home, or from the violence used in extending the limb and setting the fracture, inflammation must be excited, and pain and tumefaction will be the consequence; and these will continue for some time in every fracture; but that space will be longer or shorter in different cases, and under different circumstances: evacuation, rest, and a favourable position of the limb, will, and do in general, remove all these complaints; but bandage can contribute nothing more than by keeping the applications in their proper place; so far from it, that if the bandage be a roller, it must, by the frequent necessity of its being adjusted, and the frequent motion of the limb, in some degree counteract the proper intention of cure.

"The old writers are, in general, very precise as to the number of days during which the roller should be suffered to remain without being shifted; and the number of times which such shifting should be repeated within the first fortnight.—(See *Fab. ad Aquapendente*.) This exactitude is by no means necessary; but if the bandage be supposed to be of any use at all, it is obvious, that it ought to be renewed or adjusted as often as it may cease to perform the office for which it is designed, or whenever it shall be found to counteract such office; that is, as often as it shall become so slack as not to contain the fracture at all; or whenever the limb shall be so swollen, that the roller makes an improper degree of stricture; the former generally occurs every four or five days; the latter is most frequent within the first week.

"In most of the writers on the subject of fractures, we also find marks or signs laid down for our information concerning the due or undue effect of the bandage on the limb. They tell us, that when that part of it which is below the termination of the roller, does not swell at all, that the bandage is not sufficiently strict, and will not retain the fracture; that when

the same part is considerably swollen, or tense, or inflamed, it implies that the binding is too strait; and that a moderate degree of tumefaction is a sign that the deligation is properly executed. (See *Pubricius ab Aquapendente*.)

"In consequence of these precepts, many practitioners look more anxiously after this degree of tumefaction, than after the true and exact position of the limb; and cannot be induced to believe, that any thing can be wrong under this appearance; although, if they would for once assume the liberty of thinking for themselves, they might be convinced, that even this degree of swelling is wrong; that it implies some kind of obstruction to the circulation, and cannot serve any good purpose; and consequently, that as far as it may be supposed to be the effect of bandage, so far that bandage must be faulty.

"The third purpose for which the roller is said to be used, is the regulation and restraint of the callus.

"If we were to form our notion of callus by what the generality of writers have said on this subject, we should suppose, that it was not only a particular juice always ready for the purpose, but that, if not restrained and regulated by art, it would always flow in such quantity, as to create trouble and deformity; that there were specific remedies for increasing or decreasing it; and that it always required the hand and art of surgery to manage it. That the callus is so far a particular juice, as that it consists of whatever is destined to circulate through the bones for their particular nourishment, is beyond all doubt; and that this gelatinous kind of fluid is the medium by which fractures are united, is as true; but that it requires art to manage it, or that art is in general capable of managing and directing it, is by no means true. That this callus or uniting medium does oftentimes create tumefaction and deformity, or even lameness, is true also; but the fault in these cases does not lie in the mere redundancy of such juice; it is derived from the nature of the fracture, from the inequality of it when set, and from the unapt position of the broken ends with regard to each other; nor is surgery or the surgeon any otherwise blameable in this case, than as it was or was not originally in their power to have placed them better. It is the inequality of the fracture which makes both the real and apparent redundancy of callus, and the tumefaction in the place of union. When a bone has been broken transversely, or nearly so, and its inequalities are therefore neither many nor great, when

such broken parts have been happily and properly coaptated, and proper methods have been used to keep them constantly and steadily in such state of coaptation, the divided parts unite by the intervention of the circulating juice, just as the softer parts do, allowing a different space of time for different texture and consistence. When the union of a broken bone, under such circumstances, has been procured, the place where such union has been made will be very little perceptible, it will be no deformity, nor will it occasion any inconvenience. It will, indeed, be discoverable like a cicatrix of a wound in a softer part; but there will be no redundancy of callus, because none will be wanted, neither will there be any necessity for any particular management on the part of the surgeon to repress or keep it in order; but when a bone has been broken very obliquely, or very unequally, when the parts of a fracture are so circumstanced as not to admit of exact coaptation, when such exact coaptation as the fracture perhaps would have admitted, has not been judiciously made, when from unmanageableness, inadvertence, or spasm, the proper position of the limb has not been attended to or preserved, in all such cases there must be considerable inequality of surface; there must be risings on one side, and depressions on another; and in such cases the juices circulating through the bone, cannot accomplish the union in the same quantity, the same time, or in the same manner. The broken parts not being applied exactly to each other, there cannot be the same aptitude to unite; and according to the greater or lesser degree of exactitude in the coaptation, that is, according as the ends of the bones are, or have been, placed more or less even with regard to each other, will the inconvenience and the deformity be; and still most where the fracture is not set at all; but the broken ends of the bone unite laterally or by touching each other's sides. The reason of all this is so obvious, without having recourse to a particular specific juice under the name of callus, that it would be an insult upon the reader's understanding to explain it farther. The periosteum covering every fracture will remain thickened for some time, and a degree of fulness or rising will be thereby caused about the place where such fracture has been united; but time and the use of the muscles, soon, in general, remove this.

"In short, this doctrine of callus, considered as a particular kind of juice, and as being liable to great redundancy, if not prevented by art, has not only misled

many people, but has often been made use of as a cover to ignorance and neglect. When lameness and deformity have been the consequences of one or both these causes, more than of the nature and circumstances of a fracture, the callus has been found ready at hand to take the blame; and the ideal exuberance of this cement has often been urged as an excuse for real want of knowledge, or for gross neglect.

"The best and most useful bandage for a simple fracture of the leg or thigh, is what is commonly known by the name of the eighteen-tailed bandage, or rather one made on the same principle, but with a little difference in the disposition of the pieces. The common method is to make it so, that the parts which are to surround the limb make a right angle with that which runs lengthways under it; instead of which, if they are tacked on so as to make an acute angle, they will fold over each other in an oblique direction, and thereby sit more neatly and more securely, as the parts will thereby have more connexion with and more dependence on each other. In compound fractures, as they are called, every body sees and acknowledges the utility of this kind of bandage preferably to the roller, and for very obvious and convincing reasons, but particularly because it does not become necessary to lift up and disturb the limb every time it is dressed, or every time the bandage loosens.

"The pain attending motion in a compound fracture, the circumstance of the wound, and the greater degree of instability of parts thereby produced, are certainly very good reasons for dressing such wound with a bandage, which does not render motion necessary; but I should be glad to know what can make it necessary, or right, or eligible, to move a limb in the case of simple fracture? what benefit can be proposed by it? what utility can be drawn from it? When a broken bone has been well set, and the limb well placed, what possible advantage can arise from moving it? surely none; but, on the contrary, pain and probable mischief. Is it not the one great intention, to procure unit on? Can moving the limb every two or three days contribute to such intention? must it not, on the contrary, obstruct and retard it? Is not perfect quietude as necessary toward the union of the bone, in a simple as in a compound fracture? It is true, that in the one there is a wound which requires to be dressed, and the motion of the limb may in general be attended with rather more pain than in the other; but does motion in the simple

fracture give ease, or procure more expeditious union?

"Every benefit then which can be supposed to be obtained from the use of the common bandage or roller, is equally attainable from the use of that which I have just mentioned, with one additional, and to the patient, most invaluable advantage, viz. that of never finding it necessary to have his leg or thigh once, during the cure, removed from the pillow on which it has been properly deposited. In short, to quit reasoning and speak to fact, it is the constant practice at St. Bartholomew's, and attended with all possible success. We always use the eighteen-tailed bandage; and never move the limb to renew or adjust it.

"The parts of the general apparatus for a simple fracture, which come next in order, are the splints.

"These are generally made of paste-board, wood, or some resisting kind of stuff, and are ordered to be applied lengthways on the broken limb; in some cases three, in others four; for the more steady and quiet detention of the fracture.

"That splints, properly made and judiciously applied, are very serviceable, is beyond all doubt, but their utility depends much on their size, and the manner in which they are applied.

"The true and proper use of splints is, to preserve steadiness in the whole limb, without compressing the fracture at all. By the former they become very assistant to the curative intention; by the latter they are very capable of causing pain and other inconveniences; at the same time that they cannot, in the nature of things, contribute to the steadiness of the limb.

"In order to be of any real use at all, splints should, in the case of a broken leg, reach above the knee, and below the ankle; should be only two in number, and should be so guarded with tow, rag, or cotton, that they should press only on the joints, and not at all on the fracture.

"By this they become really serviceable; but a short splint, which extends only a little above and a little below the fracture, and does not take in the two joints, is an absurdity, and, what is worse, it is a mischievous absurdity.

"By pressing on both joints, they keep not only them, but the foot steady; by pressing on the fracture only, they cannot retain it in its place, if the foot be in the smallest degree displaced; but they may, and frequently do, occasion mischief, by rudely pressing the parts covering the

fracture against the edges and inequalities of it.

"I suppose it will be said, that although short splints do not of themselves sustain and keep steady the two joints, and consequently the limb, yet that purpose in the broken leg may be and is fulfilled by junks, fanons, and other contrivances: to which I answer, that then the short splints are in that case of no use at all, and had better be laid aside; they should be used for no other purpose, but that of keeping the limb steady; and if they do not answer that end, they are an incumbrance, and multiply the articles in the apparatus for a fractured leg, very unnecessarily.

"In the case of a fractured os femoris, if the limb be laid in an extended posture, one splint should certainly reach from the hip to the outer ankle, and another (somewhat shorter) should extend from the groin to the inner ankle. In the case of a broken tibia and fibula, there never can be occasion for more than two splints, one of which should extend from above the knee to below the ankle on one side, and the other splint should do the same on the other side. The manner of applying them, if the limb be deposited in a state of flexion, will come under the next article.

"This, and indeed the most essential article in the treatment of a fracture, is the position of the limb. Upon the judicious or injudicious, the proper or improper execution of this, depends the ease of the patient during his confinement, and the free use and natural appearance of his limb afterward.

"If I meant to describe, or if I approved (pardon the phrase) the common method of placing the broken leg and thigh in a straight manner, this would be the place to mention the many very ingenious contrivances and pieces of machinery, which practitioners, both ancient and modern, have invented for the purpose of keeping the whole limb straight and steady, that is, of keeping all the muscles surrounding the fractured bone constantly upon the stretch, and at the same time, of preventing any inequality in the union of it, and any shortening of the limb, in consequence of such inequality.

"But as it is my intention, by these sheets, to inculcate another, and, as it appears to me, a better disposition of the limb, in which such boxes, cradles, and pieces of machinery are not wanted, nor can be used, it is needless for me to say any thing about them.

"According to this plan, the fractured leg and thigh should be deposited on the pillow, in the very posture in which the

extension was made, and the fracture set, that is, with the knee bent.

"I have already been so explicit, or perhaps prolix, on the tense and lax state of the muscles, as depending on posture, under the head of extension, that I shall spare the reader, as well as myself, a good deal of trouble by referring back to that article. All that is there urged, or that can be urged for making the extension, that is, for setting a fracture in such disposition of a limb or its muscles, is equally powerful and conclusive with regard to the manner of depositing and leaving it after it has been set. Whatever renders reduction and coaptation easy, must as necessarily maintain ease during the confinement, preserve rectitude of figure, and prevent displacement. The same principle must act on both occasions; and whether the doctrine be right or wrong, considered by itself, it must be equally so in both circumstances, that is, in the manner of setting a fracture, and in the manner of depositing the limb afterward. In the case of the fractured os humeri, the only position in which it can with any tolerable convenience to the patient be placed is, with the elbow bent, that very position which necessarily relaxes and removes all the resistance of the surrounding muscles. Daily experience evinces the utility of this, by our very seldom meeting with lameness or deformity after it, notwithstanding the prevailing apprehension of exuberant callosus.

"The deformity frequently consequent to the fracture of the bones of the cubit, particularly that of the radius only, will generally, if not always, be found to be in proportion as the muscles concerned in the pronation and supination of the hand happened to be put more or less into a state of action or tension by the position of the limb.

"In the thigh, the case is still more obvious, as the muscles are more numerous and stronger.

"The straight posture puts the majority of them into action, by which action that part of the broken bone, which is next to the knee, is pulled upward, and by passing more or less underneath that part which is next to the hip, makes an inequality or rising in the broken part, and produces a shortness of the limb.

"In the fracture of both bones of the leg, the case is still the same; a straight position puts the muscles upon endeavouring to act; a moderate flexion of the knee relaxes them, and takes off such propensity.

"The disposition, therefore, of the broken cubit ought to be that which, by put-

ting the hand into a middle state between pronation and supination, and by bending the fingers moderately, keeps the radius superior to the ulna; or, in other words, the palm of the hand should be applied to the breast, the thumb should be superior, the little finger inferior; and the hand should be kept in this posture constantly by means of two splints, which should reach from the joint of the elbow on each side, and should be extended below the fingers; or the same purpose may be still better answered by a simple neat contrivance of the very ingenious Mr. Gooch of Norfolk; of which he has given a draught, and which is preferable to a common splint, by its admitting the fingers to be more easily bent.

"Extension will be made with more facility, and coaptation more happily executed; a patient will suffer a great deal less pain during these operations, as well as during the necessary confinement for a broken leg or thigh, and both patient and surgeon will be less likely to be disappointed in their intention and wish, that is, the former will be less liable to lameness or deformity, when a fractured thigh or leg has been treated in the way I have described, than in the common one.

"The resistance necessarily made by the muscles, joined to the great instability of parts in every species to fractured leg or thigh, except in the few where the bones are broken transversely, has constantly exercised the invention and ingenuity of practitioners, in devising means to prevent inequality in the callus as it is called, and shortness and deformity of the limb. Our books abound with draughts and descriptions of machines for this purpose; ligatures, pulleys, leaden weights and fracture-boxes, so constructed as to overcome and constantly to resist that action of the muscles surrounding the broken bone, that natural tendency in them to contract, which the extended position of the limb necessarily induces. Every body who has been conversant with matters of this sort knows, that even the best of these various contrivances often prove unsuccessful; and every one who will reflect ever so little, may see why they must be so. That they do prove ineffectual, the number of deformed legs and shortened thighs, which are daily met with, evinces; and that they must frequently prove so, will be obvious to every one, who will consider that the effect can last no longer than the cause is continued, unless there happens to be some very favourable circumstance in the fracture itself. What I mean is this; when the reduction of the fracture is set about, the limb is put into such position, that the surround-

ing muscles resist the extending force very considerably, and this in proportion to their strength and number: that force is continued and increased till the muscles give way, and the resistance being overcome, an opportunity is thereby obtained of placing the ends of the fracture in as apt position with regard to each other as the nature of it will admit. If the fracture be of the transverse kind, that is, if the ends of the broken bone be large, and afford a good deal of space for contact with each other, such apposition will contribute a good deal to the keeping the limb steady, and the fracture even; but if the fracture be of the oblique kind, if there be several loose pieces, and consequently neither large contact nor stability from the apposition, or if due extension has not been made, or could not, or if the ends of the bones have not been judiciously and properly set, the muscles will act as soon as the extension is relaxed, the fracture will be more or less displaced, according to the nature of it, the limb will be shortened, the time of union will be prolonged, and the place of it (the callus, as it is called,) will be in proportion more or less unequal.

"I take it for granted that it will be asked, have not our ancestors at all times happily redressed fractured legs and thighs, by the method which they have delivered down to us, and which in the preceding pages I have taken the liberty to object to? have not such limbs frequently been rendered as straight, as useful, and as little deformed as possible? I answer, most certainly, yes; it is an undoubted truth, and cannot be denied. But in my turn, let me be permitted to ask, whether in the same method, great and even unsurmountable difficulty is not frequently met with? whether in many cases the act of setting, as it is called, is not excessively painful at the time, and productive of inflammation and other disagreeable symptoms afterward? and, whether, in spite of all care, of every contrivance, of every species of machinery which has yet been used, broken thighs and legs are not often, very often, left deformed, crooked, and shortened, and that merely from the action of the muscles, and the obliquity or shattered state of the fracture? The fact is notorious, and the sole question is, whether or no a different disposition of the parts, preventing such action and such resistance, will in many instances prevent these evils? To which, from repeated experience, I answer yes. If this should be found to be the case in general, of which I make no doubt that it is; if by this method, many of such unfortunate cases, as in the common me-

thod of treatment disappoint both patient and surgeon, should be found in general to succeed so well as to satisfy both, it will prove all I wish it should prove. Superior utility and more frequent success are all I contend for.

"Many people did very well under amputation before the double incision was practised; but is the double incision therefore no improvement? The operation for the bubonocoele may be performed with that clumsy instrument the probe scissars, but is the bistoury therefore not preferable? A surgeon may cut off some ounces, or even pounds of flesh from a patient's backside, in order to cure a sinus, but is the cure by the simple division of that sinus therefore not easier or more expeditious? Neither of these can, I think, be proved, unless it can at the same time be proved, that pain is no evil, confinement not at all irksome, and that deformity and elegance of figure are synonymous terms.

"Let not the reader fancy that I would dare to amuse him with speculation, or merely specious reasoning on a subject like this. What I have said is from experience, repeated experience, both of myself and of others, for a considerable length of time past, and on a great variety of subjects; from an experience which has perfectly satisfied me, and I think will every man who will make the trial fairly and candidly. I do not pretend to say, that by these means every kind of broken bone will infallibly and certainly be brought to lie smooth, even, and of proper length; if I did, they, who are versed in these things, would know that I said too much: but I will say, (what is sufficient for my purpose) that it will not only succeed in all those, in which the old method can ever be successful; but also in the majority of those in which it is not, nor in the nature of things can. In those fortunate cases, in which either method will do, the old one is fatiguing, inconvenient, and even sometimes offensive, from the supine and confined posture of the patient; whereas that which is here proposed, gives the patient much greater liberty of motion for every purpose either of choice or necessity; and in many of those cases, wherein the old method proves most frequently so far successful, as to leave the limb short, lame, or deformed; I say, in most of these, the proposed method will not be attended with these inconveniences.

"I have already said, that in most cases of broken thigh or leg, the method just described will be attended with great success; but there is one particular case in which its utility is still more conspi-

cuous; a case which, according to the general manner of treating it, gives infinite pain and trouble both to the patient and surgeon, and very frequently ends in the lameness and disappointment of the former, and the disgrace and concern of the latter: I mean the fracture of the fibula attended with a dislocation of the tibia.

"Whoever will take a view of the leg of a skeleton, will see that although the fibula be a very small and slender bone, and very inconsiderable in strength, when compared with the tibia, yet the support of the lower joint of that limb (the ankle) depends so much on this slender bone, that without it the body would not be upheld, nor locomotion performed, without hazard of dislocation every moment. The lower extremity of this bone, which descends considerably below that end of the tibia, is by strong and inelastic ligaments firmly connected with the last named bone, and with the astragalus, or that bone of the tarsus which is principally concerned in forming the joint of the ankle. This lower extremity of the fibula has, in its posterior part, a superficial sulcus for the lodgment and passage of the tendons of the peronei muscles, which are here tied down by strong ligamentous capsulae, and have their action so determined from this point or angle, that the smallest degree of variation from it, in consequence of external force, must necessarily have considerable effect on the motions they are designed to execute, and consequently distort the foot. Let it also be considered, that upon the due and natural state of the joint of the ankle, that is, upon the exact and proper disposition of the tibia and fibula, both with regard to each other and to the astragalus, depend the just disposition and proper action of several other muscles of the foot and toes; such as the gastrocnemii, the tibialis anticus, and posticus, the flexor pollicis longus, and the flexor digitorum pedis longus, as must appear demonstrably to any man who will first dissect, and then attentively consider these parts.

"If the tibia and fibula be both broken, they are both generally displaced in such manner, that the inferior extremity, or that connected with the foot, is drawn under that part of the fractured bone which is connected with the knee; making by this means a deformed, unequal tumefaction in the fractured part, and rendering the broken limb shorter than it ought to be, or than its fellow. And this is generally the case, let the fracture be in what part of the leg it may.

"If the tibia only be broken, and no

act of violence, indiscretion, or inadvertence be committed, either on the part of the patient or of those who conduct him, the limb most commonly preserves its figure and length; the same thing generally happens if the fibula only be broken, in any part of it between its upper extremity, and within two or three inches of its lower one.

"Two kinds of fractures there are, and only two that I can recollect (relative to the limbs) which do not admit of the bent position of the joints, I mean that of the processus olecranon at the elbow, and that of the patella, in these a straight position of the arm and leg is necessary; in the former to keep the fractured parts in contact till they are united; in the latter, to bring them as near to each other as may best serve the purpose of walking afterward.*

"With regard to the fracture of the patella, an opinion has long and generally prevailed, which seems to me to have no foundation in truth, or (when duly considered) even in probability; it is, that the great degree of stiffness in the joint of the knee, which is sometimes found to be the consequence of this kind of fracture, is

* "Although a straight position of the limb is necessary for the broken patella, yet this very position becomes so upon the same principle, as renders the bent posture most advantageous in the broken tibia and femur, viz. the relaxation of the muscles and tendons attached to the fractured bone.

"Whoever will for a moment attend to the disposition of the pieces in a patella, which has been broken transversely, will see how little necessary or useful the many contrivances of bandages, straps, compresses, buckles, buttons, &c. to be found in writers are, especially all that part of them which are applied to the inferior fragment.

"By the action of the united tendons of the extensores muscles of the leg, the superior fragment is pulled upward and separated from the inferior, but the latter remains nearly, if not absolutely, where it was before the accident; there is nothing to act upon it, and therefore it cannot, nor does it move.

"The extension of the leg puts the muscles attached to the upper part of the broken bone into a state of relaxation, and prevents their acting; and though a small compress just above this piece, with a moderate bandage, may be useful toward retaining it, yet it is the position of the leg, which must keep the broken piece down, and effect the cure." (*Pott.*)

owing to, or produced by, a quantity of callus falling into it from the edges of the broken bone: and that the nearer the broken pieces are brought to each other, the more likely such consequence is

"Every part of this doctrine seems equally absurd. In the first place, the fractured bone is by no means capable of supplying such a quantity of callus as to produce this end, unless it may be supposed to run from it as solder from a plumber's ladle; in the second place, if this was the case, the most likely, and indeed the only probable way of preventing the deposition of such juice, must be by bringing the broken pieces into close contact; and in the third place, there is no authority from the appearance of such joints after death, (at least as far as my experience goes) to suppose this to be the case, or to countenance such opinion. The cause therefore of this rigidity, which is now and then found to attend the broken patella, must be sought for elsewhere, viz. in the long rest and confinement of the joint as a means used by many to procure exact union; in mischief done to the ligament, which is formed by the united tendons of the four extensor muscles of the leg, at the time of and by the fracture; and in the nature of the fracture itself, that is, the manner in which the bone shall happen to be broken.

"But, be all this as it may, the fact undoubtedly is, that they walk best after such accident, whose patella has been broken transversely, and that into two nearly equal fragments; whose confinement to the bed has been short, that is, no longer than while the inflammation lasted; whose knee, after such period, has been daily and moderately moved; and in whom the broken pieces are not brought into exact contact, but lie at some small distance from each other.

"I cannot take leave of this subject of simple fractures, without mentioning a circumstance relative to them, which although, when rightly understood, is of little or no importance, yet by being misunderstood, becomes frequently of considerable consequence.

"I mean, the use of the term, *rising end of a broken bone.*

"By the expression, any one unacquainted with these things would be inclined to think, that the prominent part of a broken bone rose, or was elevated from its natural place; and became, by such rising, superior to the other part or extremity of the fracture. This would certainly be the idea of an ignorant person, and as such would be of little consequence; but by the practice of many, who call themselves surgeons, it is as certainly

their idea also, and this renders it a matter of great consequence. Many instances are producible, in which our conduct is in great measure regulated by the language which we use. Having no ideas annexed to our words, leads us into absurdity and unintelligibility; but false ones influence us still more, and frequently produce very material errors.

"The fistula lachrymalis, the fistula in perinaeo, and that in ano, are glaring proofs of this; and my present subject is full as much so: for upon the erroneous idea annexed to the term *rising end*, stands all the absurd practice of compress, bolster, and strict bandage, in the cases of simple fracture.

"The truth is, that there is really no *rising end* to a broken bone; I mean, when applied, as the term usually is, to the leg, thigh, and clavicle. There is indeed a superior or prominent end or part, and an inferior or depressed one, but the former of these is in its proper place, from which it cannot by art be moved; and the latter, which is not in its proper place, is very capable by art of being put into it.

"Perhaps this may to some appear a mere play of words, a nominal distinction, without a real difference; but when the influence, which a right, or wrong idea of this produces on practice, is attended to, the consequence will be obvious and serious.

"When a collar-bone, or femoris, or tibia and fibula are broken, by the action of the muscles, by the motions of the patient, and by the mere weight of the inferior part of the arm, thigh, or leg, the fractured ends of such bones are displaced, and always displaced in such manner, that the inequality occasioned necessarily by such displacement, proceeds from the inferior end of the fractured bone being retracted or drawn under the superior; this produces a tumefaction or unequal rising, and the upper extremity of the fracture is therefore called the *rising end* of it. Now the man who regards this *rising end* as that part of the fracture which has by such rising got out of its place, and not as having accidentally become the prominent part merely by the insinuation or retraction of the other part underneath it, will go to work with bolster, compress, and bandage, in order to bring and keep such end down; by which means he will give his patient considerable pain, and while he depends on such means alone, will most certainly be frustrated in his intention and expectation, the means not being adequate to the proposed end. But the man who looks on this in the true light, that is, who looks on the su-

perior part in its proper place, and the inferior as being displaced by the weight of the limb, and the action of the muscles, will know, that by the mere position of such limb, he shall be able to remedy all the inconvenience and deformity, as far as they are by art capable of remedy, without the parade or the fatigue of useless apparatus.

"He will, for example, know that the prominent part of a broken clavicle, that part of it which is next to the sternum, is just where it should be; and that the inferior part, that which is connected with the scapula, is out of its place, by being drawn down by the weight of the arm; and therefore instead of loading, as is usual, the prominent part with quantities of compress, which never can do any service, he, by a proper elevation of the arm, will bring the lower end upward into contact with the other; and thereby, with very little trouble, easily accomplish what he never can do in any other manner, however operose.

"The same thing will happen from the same principles in the leg and thigh; a prominence, or a *rising end*, there always will be, but that *rising end* is never to be brought down by any pressure from compress or bandage; the fallen or inferior one must always be brought up to it by the proper position of the rest of the limb: this will always remove the inequality as far as it is removable, and nothing else can."

* "In a profest regular treatise on this subject, it would be right to take notice of what may be called the *infortunia*, or accidental evils, which sometimes accompany even simple fractures; such are, disease arising from injury done to the medullary membrane, within the bones, in bad habits: hemorrhage, or a species of spurious aneurism, from a wound of the interosseal artery, between the tibia and fibula, or of either of the carpal arteries: mischief from the fracture becoming accidentally the seat of the crisis of a fever: deficiency of callus, or the accident of the broken bone not uniting: the fractured limb becoming the seat of an erysipelas, terminating in a slough of the common membrane and periosteum: the gelatinous juice or callus, which should unite the fracture, being in so morbid a state, as to produce a kind of caries with exostosis, instead of its doing its proper duty, &c. Of all these there are examples, but they do not come within the plan which I prescribed to myself when I began these papers." (*Pott*)

COMPOUND FRACTURES.

"I use the term compound fracture, (says Mr. Pott) in the sense in which the English have always used it; that is, to imply a broken bone complicated with a wound.

"In this kind of case the first object of consideration is, whether the preservation of the fractured limb can, with safety to the patient's life, be attempted; or, in other words, whether the probable chance of destruction, from the nature and circumstances of the accident, is not greater than it would be from the operation of amputation. Many things may occur to make this the case. The bone, or bones, being broken into many different pieces, and that for a considerable extent, as happens from broad wheels, or other heavy bodies of large surface, passing over, or falling on such limbs; the skin, muscles, tendons, &c. being so torn, lacerated, and destroyed, as to render gangrene and mortification the most probable and most immediate consequence; the extremities of the bones forming a joint being crushed, or as it were comminuted, and the ligaments connecting such bones being torn and spoiled, are, among others, sufficient reasons for proposing and for performing immediate amputation. Reasons, which (notwithstanding any thing that may have been said to the contrary) long and reiterated experience has approved, and which are incapable upon every principle of humanity, or chirurgic knowledge.

"When a surgeon says, that a limb, which has just suffered a particular kind of compound fracture, ought rather to be immediately cut off, than that any attempt should be made for its preservation, he does not mean by so saying that it is absolutely impossible for such limb to be preserved at all events; he is not to be supposed to mean so much in general, though sometimes even that will be obvious; all that he can truly and justly mean is, that from the experience of time it has been found, that the attempts to preserve limbs so circumstanced, have most frequently been frustrated by the death of the patients, in consequence of such injury; and that from the same experience it has been found, that the chance of death from amputation is by no means equal to that arising from such kind of fracture.

"Every man knows, that apparently desperate cases are sometimes cured; and that limbs so shattered and wounded, as to render amputation the only *probable* means for the preservation of life, are now and then saved. This is an uncontro-

verted fact, but a fact which proves very little against the common opinion; because every man of experience also knows, that such escapes are very rare, much too rare to admit of being made precedents, and that the majority of such attempts fail.

"This consideration relative to amputation is of the more importance, because it most frequently requires immediate determination; every minute of delay is, in many instances, to the patient's disadvantage; and a very short space of time indeed, frequently makes all the difference between probable safety and fatality. If these cases in general would admit of deliberation for two or three days, and during that time such circumstances might be expected to arise, as ought necessarily to determine the surgeon in his conduct, without adding to the patient's hazard, the difference would be considerable; the former would not seem to be so precipitate in his determination, as he is frequently thought to be; and the latter, being more convinced of the necessity, would submit to it with less reluctance. But unhappily for both parties, this is seldom the case; and the first opportunity having been neglected or not embraced, we are frequently denied another. Here therefore the whole exertion of a man's judgment is required, that he may neither rashly and unnecessarily deprive his patient of a limb, nor through a false tenderness and timidity, suffer him to perish, by endeavouring to preserve such limb. Some degree of address is also necessary upon such occasion, in order to convince the patient, that what seems to be determined upon hastily and with precipitation, will not safely admit of longer deliberation.

"The limb being thought capable of preservation, the next consideration is the reduction of the fracture. The ease or difficulty attending this, depends not only on the general nature of the case, but on the particular disposition of the bone with regard to the wound.

"If the bone be not protruded forth, the trouble of reducing, and of placing the fracture in a good position, will be much less than if the case be otherwise: and in the case of protrusion or thrusting forth of the bone or bones, the difficulty is always in proportion to the comparative size of the wound, through which such bone has passed. In a compound fracture of the leg or thigh, it is always the upper part of the broken bone which is thrust forth. If the fracture be of the transverse kind, and the wound large, a moderate degree of extension will in general easily reduce it; but if the fracture be oblique,

and terminates, as it often does, in a long sharp point, this point very often makes its way through a wound no larger than just to permit such extension. In this case, the very placing the leg in a straight position, in order to make extension, obliges the wound or orifice to gird the bone tight, and makes all that part of it, which is out of such wound, press hard on the skin of the leg underneath it. In these circumstances, all attempts for reduction in this manner will be found to be impracticable; the more the leg is stretched out, the tighter the bone will be begirt by the wound, and the more it will press on the skin underneath.

"Upon this occasion, it is not very unusual to have recourse to the saw, and by that means to remove a portion of the protruded bone.

"I will not say that this is always or absolutely unnecessary or wrong, but it most certainly is frequently so. In some few instances, and in the case of extreme sharp-pointedness of the extremity of the bone, it may be, and undoubtedly is right; but, in many instances, it is totally unnecessary.

"The two most proper means of overcoming this difficulty are, change of posture of the limb, and enlargement of the wound. In many cases the former of these, under proper conduct, will be found fully sufficient; and where it fails, the latter should always be made use of. Whoever will attend to the effect, which putting the leg or thigh (having a compound fracture and protruded bone) into a straight position always produces; that is, to the manner in which the wound in such position girds the bone, and to the increased difficulty of reduction thereby induced, and will then, by changing the posture of such limb from an extended one, to one moderately bent, observe the alteration thereby made, in both the just-mentioned circumstances, will be satisfied of the truth of what I have said, and of the much greater degree of ease and practicability of reduction in the bent, than in the extended position; that is, in the relaxed, than in the stretched state of the muscles. Reduction being found impracticable, either by extension or change of posture, the obvious and necessary remedy for this difficulty is enlargement of the wound. This to some practitioners, who have not seen much of this business, appears a disagreeable circumstance, and therefore they endeavour to avoid it; but their apprehensions are in general groundless and ill-founded; in enlarging the wound there is neither difficulty nor danger, it is the skin only which can require division, and in making such wound there

can be no possible hazard. It is needless to say that the division should be such as to render reduction easy; or to remind the practitioner, that such enlarged opening may serve very good future purposes, by making way for the extraction of fragments, and the discharge of matter, sloughs, &c.

"If the bone be broken into several pieces, and any of them be either totally separated, so as to lie loose in the wound, or if they be so loosened and detached, as to render their union highly improbable, all such pieces ought to be taken away; but they should be removed with all possible gentleness, without pain, violence, or laceration, without the risk of hemorrhage, and with as little poking into the wound as possible. If the extremities of the bone be broken into sharp points, which points wound and irritate the surrounding parts, they must be removed also. But the whole of this part of the treatment of a compound fracture should be executed with great caution; and the practitioner should remember, that if the parts surrounding the fracture be violated, that is, be torn, irritated, and so disturbed as to excite great pain, high inflammation, &c. it is exactly the same thing to the patient, and to the event of the case, whether such violence be the necessary consequence of the fracture, or of his unnecessary, and awkward manner of poking into, and disturbing the wound. The great objects of fear and apprehension in a compound fracture, (that is, in the first or early state of it) are, pain, irritation, and inflammation; these are to be avoided, prevented, and appeased by all possible means, let every thing else be as it may; and although certain things are always recited, as necessary to be done, such as removal of fragments of bone, of foreign bodies, &c. &c. &c. yet it is always to be understood, that such acts may be performed without prejudicial or great violence, and without adding at all to the risk or hazard necessarily incurred by the disease.

"Reduction of, or setting a compound fracture is the same as in the simple; that is, the intention in both is the same, viz. by means of a proper degree of extension to obtain as apt a position of the ends of the fracture with regard to each other, as the nature of the case will admit, and thereby to produce as perfect and as speedy union as possible.

"To repeat in this place what has already been said under the head of Extension would be tedious and unnecessary. If the arguments there used for making extension, with the limb so moderately bent as to relax the muscles, and take off

their power of resistance, have any force at all, they must have much more when applied to the present case: if it be allowed to be found very painful to extend, or to put or keep on the stretch, muscles which are not at all or but slightly wounded, and only liable in such extension to be pricked and irritated, it is self-evident that it must be much more so when the same parts are torn and wounded considerably: when the ends of the fractured bone have made their way quite through them, divided the skin, and laid all open to the access of the air.

"Every consequence, which does, or may be supposed to flow from wound, pain, or irritation, in consequence of violence, must necessarily be much greater, when a lacerated wound, and that made by the bone, is added to the fracture; not to mention the ills arising from extending or stretching out muscles already torn or half divided.

"One moment's reflection must be sufficient to convince any reasonable man: but experience is the only proper test of all these kinds of things. Let this method of treatment, then, be fairly and properly subjected to it; and if the great advantage of the one over the other does not appear, that is, if the less sensation of pain by the patient, and the more happy, more perfect, and more expeditious accomplishment of his purpose by the surgeon, do not determine greatly in favour of relaxed position, I am, and have for a considerable length of time, been greatly mistaken.

"The wound dilated, (if necessary) loose pieces removed, (if there were any) and the fracture reduced, and placed in the best possible position, the next thing to be done is to apply a dressing.

"On this subject a great deal has been said by writers, particularly by such of them as have implicit faith in external applications; but, in order to be able to execute this part of the process properly, a man has only to ask himself, What are the intentions which, by any kind of dressing to a compound fracture, he means to aim at the accomplishment of? And a rational answer to this will give him all that he can want to know.

"The dressing necessary in a compound fracture is of two kinds, viz. that for the wound, and that for the limb. By the former, we mean to maintain a proper opening for the easy and free-discharge of gleet, sloughs, matter, extraneous bodies, or fragments of bone, and this in such manner, and by such means, as shall give the least possible pain or fatigue, shall neither irritate by its qualities, nor oppress by its quantity,

nor by any means contribute to the detention or lodgment of what ought to be discharged. By the latter, our aim should be the prevention or removal of inflammation, in order, if the habit be good, and all other circumstances fortunate, that the wound may be healed, by what the surgeons call the first intention, that is, without suppuration or abscess; or, that not being practicable, that gangrene and mortification, or even very large suppuration may be prevented, and such a moderate and kindly degree of it established as may best serve the purpose of a cure. The first therefore, or the dressing for the wound, can consist of nothing better, or indeed so good, as soft dry lint, laid on so lightly as just to absorb the sanies, but neither to distend the wound, or be the smallest impediment or obstruction to the discharge of matter. This lint should be kept clear of the edges, and the whole of it should be covered with a pledget spread with a soft easy digestive. The times of dressing must be determined by the nature of the case; if the discharge be small or moderate, once in twenty-four hours will be sufficient; but if it be large, more frequent dressing will be necessary, as well to prevent offence, as to remedy the inconveniences arising from a great discharge of an irritating sharp sanies.

"The method of treating the limb, with a view to the prevention of such accidents and symptoms, as pain, inflammation, and laceration of parts, are likely to produce, is different with different practitioners; some using from the very first, relaxing, greasy applications; others applying medicines of very different nature. Both these may be right conditionally, that is, according to different circumstances in the case, but they cannot be equally so in the same circumstances.

"Many practitioners are accustomed to envelope compound fractures in a soft, warm, relaxing cataplasm from the very first: whether the limb be in a tense swollen state, or not. This, if I may take the liberty of saying so, appears to me to be injudicious. When from neglect, from length of time passed without assistance, from misconduct or drunkenness in the patient, from awkwardness and unhandiness in the assistants, or from any other cause, a tension has taken possession of the limb, and it is become tumid, swollen and painful, a warm cataplasm is certainly the best and most proper application that can be made, and that for very obvious reasons the state of the parts under these circumstances is such, that immediate union is

impossible, and nothing but a free and plentiful suppuration can dissipate or remove impending mischief; every thing therefore which can tend toward relaxing the tense, swollen, and irritable state of the parts concerned, must necessarily be right; the one thing aimed at, (plentiful suppuration) cannot be accomplished without it. But when the parts are not in this state, the intention seems to be very different. To relax swollen parts, and to appease pain and irritation by such relaxation, is one thing; to prevent inflammatory defluxion and tumefaction, is certainly another; and they ought to be aimed at by very different means. In the former, a large suppuration is a necessary circumstance of relief, and the great means of cure; in the latter it is not, and a very moderate degree of it is all that is required. The warm cataplasm therefore, although it be the best application that can be made use of in the one case, is certainly not so proper in the other, as applications of a more discutient kind, such as mixtures of spirit. vini, vinegar and water, with crude sal ammoniac, spirit. mindereri, acet. litharg. and medicines of this class, in whatever form the surgeon may choose. By these, in good habits, in fortunately circumstanced cases, and with the assistance of what should never be neglected, (I mean phlebotomy,* and the general antiphlogistic regimen,) inflammation may sometimes be kept off, and a cure accomplished, without large collections or discharges of matter, or that considerable degree of suppuration, which, though necessary in some cases, and almost unavoidable in others, are and must be rather promoted and encouraged, than retarded, or prevented, by warm relaxing applications of the poultice kind.

"Compound fractures in general require to be dressed every day; and the wounded parts not admitting the smallest degree of motion without great pain, perfect quietude becomes as necessary as frequent dressing.

"The common bandage therefore (the roller) has always in this case been laid aside, and what is called the eighteen-tailed bandage substituted, very judiciously, in its place. Of this I have already spoken so largely, as to make repetition unnecessary.

"Splints, that is, such short ones, as are most commonly made use of in simple fractures, are by all forbid in the compound, and that for the same reason which

ought to have prevented them from having ever been used in the former, viz. because the probable good to be derived from them can be but little; and the probable mischief is obvious and considerable.

"But although short splints are for many reasons palpably improper, in both cases, yet those of proper length, those which reach from joint to joint, comprehend them both, and are applied on each side of the leg only, are very useful both in the simple and in the compound fracture, as they may, thus applied, be made to keep the limb more constantly steady and quiet, than it can be kept without them.

"With regard to position of the limb, I have already been so explicit, when speaking of the simple fracture, that to say any thing more about it here would be an abuse of the reader's time and patience. The only, or the material difference between a simple and a compound fracture, as far as relates to this part of the treatment is, that as the parts surrounding the broken bone in the latter are more injured, and consequently more liable to irritation, pain, inflammation, and all their consequences, therefore every method and means, by which the alleviation of such symptoms, and the prevention of such consequences can be obtained, is still more necessary and requisite. Among these, the posture of the limb is so principal a circumstance, that without its concurrence every other will be fruitless. The points to be aimed at are, the even position of the broken parts of the bone, and such disposition of the muscles surrounding them, as is most suitable to their wounded, lacerated state, as shall be least likely to irritate them, by keeping them on the stretch, or to produce high inflammation, and at best large suppuration. These, I say, are the ends to be pursued; and how much the position of the limb does, and must necessarily contribute to the advantage, or disadvantage just recited, must be so obvious to any body capable of reflection, that nothing more need be said about it.

"At the beginning of these sheets, I have said, that it was not my intention to write a regular treatise, but only to throw out a few hints which I hoped might prove useful to such as have not yet received better information. The part of my subject at which I am now arrived, does not indeed admit of much more: a few general precepts are all which a writer can give; the particular method of conducting each particular case must be determined by the nature of that case, and by the judgment of the surgeon.

* Bleeding is now not frequently practised, except on very plethoric persons, and out of large cities.

"Every body knows, or ought to know, that these cases, of all others, require at first the most rigid observance of the antiphlogistic regimen; that pain is to be appeased, and rest obtained, by anodynes; that inflammation is to be prevented or removed, by free and frequent bleeding, by keeping the body open, and by the administration of such medicines as are best known to serve such purposes. And that, during this first state or stage, the treatment of the limb must be calculated, either for the prevention of inflammatory tumefaction, by such applications as are in general known by the title of discutients; or, such tumour and tension having already taken possession of the limb, that warm fomentation, and relaxing and emollient medicines are required.

"If these, according to the particular exigence of the case, prove successful, the consequence is, either a quiet easy wound, which suppurates very moderately, and gives little or no trouble; or a wound, attended at first with considerable inflammation, and that producing large suppuration, with great discharge, and troublesome formation and lodgment of matter. If, on the other hand, our attempts do not succeed, the consequence is gangrene and mortification.

"These are the three general events or terminations of a compound fracture, and according to these must the surgeon's conduct be regulated.

"In the first instance, he has indeed nothing to do but to avoid doing mischief, either by his manner of dressing, or by disturbing the limb. Nature let alone, will accomplish her own purpose; and art has little more to do than to preserve the due position of the limb, and to take care, that the dressing applied to the wound proves no impediment.

"In the second stage, that of formation and lodgment of matter, in consequence of large suppuration, all a surgeon's judgment will sometimes be required in the treatment both of the patient and his injured limb. Enlargement of the present wound, for the more convenient discharge of matter;* new or

counter-openings for the same purpose, or for the extraction of fragments of broken or exfoliated bone, will very frequently be found necessary, and must be executed. In the doing this, care must be taken, that what is requisite be done, and no more; and that such requisite operations be performed with as little disturbance and pain as possible; the manner of doing business of this kind, will make a very material difference in the sufferings of the patient.

"Very contrary, or at least very different intentions, seem to me to require the surgeon's very particular attention in the two parts of this stage of the disease.

"Previous to large suppuration, or considerable collections and lodgments of matter, tumefaction, induration, and high inflammation, attended with pain, irritation, and fever, require evacuation by phlebotomy, an open belly, and antiphlogistic remedies, as well as the free use of anodynes, and such applications to the limb as may most serve the purpose of relaxation. But the matter having been formed and let out, and the pain, fever, &c. which were symptomatic thereof, having disappeared, or ceased, the use and purpose of such medicines and such applications cease also, and they ought therefore to be discontinued. By evacuation, &c. the patient's strength has necessarily (and indeed properly) been reduced; by cataplasms, &c. the parts have been so relaxed as to procure an abatement or cessation of inflammation, a subsidence of tumefaction, and the establishment of a free suppuration; but these ends once fairly and fully answered, another intention arises, which regards the safety and well-doing of the patient, nearly, if not full as much as the former; which intention will be necessarily frustrated by pursuing the method hitherto followed. The patient now will require refection and support, as much as he before stood in need of reduction; and the limb, whose indurated and inflamed state hitherto required the emollient and relaxing poultice, will now be hurt by such kind of application, and stand in need of such as are endued with contrary qualities, or at least, such as shall not continue to relax. Good light, easily digested nutriment, and the Peruvian bark, will best answer the purpose of internals; the discontinuation of the cataplasms, and the application of medicines of the corroborating kind, are as

* "It is a practice with some, from a timidity in using a knife, to make use of bolsters and plaster compresses for the discharge of lodging matter. Where another, or a counter-opening can conveniently and safely be made, it is always preferable, the compress sometimes acting diametrically opposite to the intention with which it is applied, and contributing to the lodgment by confining the matter; beside which, it requires a greater degree

of pressure to make it efficacious, than a limb in such circumstances generally can bear."

necessary with regard to externals.*

"In short, if there be any rationale in the use of the cataplasm in the first stage, its impropriety in the second, must be evident from the same principles. So also with regard to evacuation and the antiphlogistic regimen, when all the good proposed to be obtained by them has been received, a pursuit of the same method must become injurious, and that for the same reason why it was before necessary and beneficial.

"A non-attention to this has, I believe, been not infrequently the cause of the loss both of limbs and lives.

"Every body who is acquainted with surgery knows, that in the case of bad compound fracture, attended with large suppuration, it sometimes happens, even under the best and most judicious treatment, that the discharge becomes too great for the patient to sustain; and that, after all the fatigue, pain, and discipline, which he has undergone, it becomes necessary to compound for life by the loss of the limb. † This, I say, does sometimes happen under the best and most rational treatment; but I am convinced that it also is now and then the consequence of pursuing the reducing, the antiphlogistic, and, the relaxing plan too far. I would therefore take the liberty seriously to advise the young practitioner, to attend diligently to his patient's pulse and general state, as well as to that of his fractured limb and wound; and when he finds all febrile complaint at an end, and all inflammatory tumour and hardness gone, and his patient is rather languid than feverish,

* "It is surprising how large and how disagreeable a discharge will be made for a considerable length of time, in some instances, from the detention and irritation of a splinter of bone. If therefore such discharge be made, and there be neither sinus nor lodgment to account for it, and all other circumstances are favourable, examination should always be made, in order to know whether such cause does not exist, and if it does, it must be gently and carefully removed."

† "There is one circumstance relative to compound fractures, which perhaps may be deemed worth noticing; which is, that I do not remember ever to have seen it necessary to amputate a limb for a compound fracture, on account of the too great discharge, in which the fracture had been united. In all those cases, where the operation has been found necessary on account of the drain, the fracture has always been perfectly loose and disunited." (Pott.)

that his pulse is rather weak and low than hard and full, that his appetite begins to fail, and that he is inclined to sweat, or purge, without assignable cause, and this in consequence of a large discharge of matter from a limb which has suffered great inflammation, but which is now become rather soft and flabby, than hard and tumid; that he will in such circumstances set about the support of his patient, and the strengthening of the diseased limb *totis viribus*; in which I am from experience satisfied, he may often be successful, where it may not be generally expected that he would. At least, he will have the satisfaction of having made a rational attempt; and if he is obliged at last to have recourse to amputation, he will perform it, and his patient will submit to it, with less reluctance, than if no such trial had been made.

"I have said, that a compound fracture either unites and heals, as it were, by the first intention, which is the case of some of the lucky few, (and was my own;*) or it is attended with high inflammation, multiplied abscesses, and large suppuration, demanding all a surgeon's attention and skill, and even then sometimes ending in the loss of limb, or life, or both; or, that all our attempts prove fruitless from the first, and gangrene and mortification are the inevitable consequence of the accident.

"The two first I have already spoken to, the last only remains.

"Gangrene and mortification are sometimes the inevitable consequences of the mischief done to the limb at the time that the bone is broken; or they are the consequences of the laceration of parts made by the mere protrusion of the said bone.

"They are also sometimes the effect of improper or negligent treatment; of great violence used in making extension; of irritation of the wounded parts, by poking after, or in removing fragments or splinters of bone; of painful dressings; of improper disposition of the limb, and of the neglect of phlebotomy, anodynes, evacuation, &c. Any, or all these, are capable either of inducing such a state of inflammation as shall end in a gangrene, or of permitting the inflammation, necessarily attendant upon such accident, to terminate in the same event.

"When such accident, or such disease, is the mere consequence of the injury done to the limb, either at the time of, or by the fracture, it generally makes its appearance very early; in which case also,

* Mr. Pott suffered a compound fracture of his own leg.

its progress is generally too rapid for art the check. For these reasons, when the mischief seems to be of such nature as that gangrene and mortification are most likely to ensue, no time can be spared, and the impending mischief must either be submitted to or prevented by early amputation. I have already said, that a very few hours make all the difference between probable safety and destruction. If we wait till the disease has taken possession of the limb, even in the smallest degree, the operation will serve no purpose, but that of accelerating the patient's death. If we wait for an apparent alteration in the part, we shall have waited until all opportunity of being really serviceable is past. The disease takes possession of the cellular membrane surrounding the large blood-vessels and nerves, some time before it makes any appearance in the integuments; and will always be found to extend much higher in the former part, than its appearance in the latter seems to indicate. I have more than once seen the experiment made of amputating, after a gangrene has been begun, but I never saw it succeed; it has always hastened the patient's destruction.

"As far therefore as my experience will enable me to judge, or as I may from thence be permitted to dictate, I would advise that such attempt should never be made; but, the first opportunity having been neglected, or not embraced, all the power of the chirurgic art is to be employed in assisting nature to separate the diseased part from the sound; an attempt which now and then, under particular circumstances, has proved successful, but which is so rarely so, as not to be much depended upon.

"If the parts are so bruised and torn, that the circulation through them is rendered impracticable, or if the gangrene is the immediate effect of such mischief, the consequence of omitting amputation, and of attempting to save the limb is, as I have already observed, most frequently very early destruction: but, if the gangrenous mischief be not merely and immediately the effect of the wounded state of the parts, but of high inflammation, badness of general habit, improper disposition of the limb, &c. it is sometimes in our power so to alleviate, correct, and alter these causes, as to obtain a truce with the disease, and a separation of the unsound parts from the sound. The means whereby to accomplish this end must, in the nature of things, be varied according to the producing causes or circumstances: the sanguine and bilious must be lowered and emptied; the weak and debilitated must be assisted by such medicines as

will add force to the *vis vite*; and errors in the treatment of the wound or fracture must be corrected; but it is evident to common sense, that for these there is no possibility of prescribing any other than very general rules indeed. The nature and circumstances of each individual case must determine the practitioner's conduct.

"In general, inflammation will require phlebotomy and an open belly, together with the neutral antiphlogistic medicines; pain and irritation will stand in need of anodynes, and the Peruvian bark, joined in some cases, and at some times, with those of the cooling kind, at others with the cordial, will be found necessary and useful. So also tension and induration will point out the use of fomentation and warm relaxing cataplasms, and the most soft and lenient treatment and dressing. But there are two parts of the treatment of this kind of case mentioned by the generality of writers, which I cannot think of as they seem to have done. One is, the use of stimulating antiseptic applications to the wound; the other is, what is commonly called scarification of the limb. [Let it be remarked, that I speak of both these, as prescribed and practised while the gangrene is forming, as it were, and the parts are by no means mortified.] While the inflammatory tension subsists, alleviation of pain, and relaxation of the wounded and swollen parts, in order to obtain a suppuration, and consequently a separation, seem to constitute the intention, which ought to be pursued upon the most rational principles: warm irritating tinctures of myrrh, aloes, and euphorbium; mixtures of tinct. myrrh. with oel. Ægyptiac. and such kind of medicines, which are found to be frequently ordered, and indeed are frequently used, particularly in compound fractures produced by gun-shot, seem to me to be very opposite to such intention, and very little likely to produce or to contribute to the one thing which ought to be aimed at, I mean the establishment of a kindly suppuration. I know what is said, in answer to this, viz. that such kind of stimulus assists nature in throwing off the diseased parts; but this is a kind of language, which I believe will be found upon examination to have been first used without any sufficient or good ground, and to have been echoed ever since upon trust. It had its foundation in the opinion that gun-shot wounds were poisonous, and that the mortification in them was the effect of fire; and it has been continued ever since, to the great detriment of many a sufferer. A gun-shot wound, whether with or without fracture, is a wound accompanied with the highest degree of contusion, and

with some degree of laceration ; and every greatly contused and lacerated wound requires the same kind of treatment which a gun-shot wound does, as far as regards the soft parts. The intention in both ought to be to appease pain, irritation, and inflammation ; to relax the indurated, and to unload the swollen parts ; and by such means to procure a kindly supuration ; the consequence of which must be, a separation of the diseased parts from the sound. Now, whether this is likely to be best and soonest accomplished by such dressings and such applications as heat and stimulate, and render the parts to which they are applied crisp and rigid, may fairly be left to common sense to determine.

“Scarification, in the manner, and at the time, in which it is generally ordered and performed, has never appeared to me to have served any one good purpose. When the parts are really mortified, incisions made of sufficient depth will give discharge to a quantity of acrid and offensive ichor ; will let out the confined air, which is the effect of putrefaction ; and thereby will contribute to unloading the whole limb ; and they will also make way for the application of proper dressings. But while a gangrene is impending, that is, while the parts are in the highest state of inflammation, what the benefit can be which is supposed or expected to proceed from scratching the surface of the skin with a lancet, I never could imagine ; nor, though I have often seen it practised, do I remember ever to have seen any real benefit from it. If the skin be still sound, and of quick sensation, the scratching it in this superficial manner is painful, and adds to the inflamed state of it ; if it be not sound, but quite altered, such superficial incision can do no possible service ; both the sanies and the imprisoned air, are beneath the membrana adiposa ; and merely scratching the skin in the superficial manner, in which it is generally done, will not reach to, or discharge either.

“From what has been said, it will appear, that there are three points of time, or three stages, of a bad compound fracture, in which amputation of the limb may be necessary and right ; and these three points of time are so limited, that a good deal of the hazard or safety of the operation depends on the observance or non-observance of them.

“The first is immediately after the accident, before inflammation has taken possession of the parts. If this opportunity be neglected or not embraced, the consequence is either a gangrene or a large suppuration, with formation and lodg-

ment of matter. If the former of these be the case, the operation ought never to be thought of, till there is a perfect and absolute separation of the mortified parts. If the latter, no man can possibly propose the removal of a limb, until it be found, by sufficient trial, that there is no prospect of obtaining a cure without ; and that, by not performing the operation, the patient's strength and life will be exhausted by the discharge. When this becomes the hazard, the sooner amputation is performed the better. In the first instance, the operation ought to take place before inflammatory mischief is incurred ; in the second, we are to wait for a kind of crisis of such inflammation ; in the third, the proportional strength and state of the patient, compared with the discharge and state of the fracture, must form our determination.” (*Pott's Remarks on Fractures.*)

PARTICULAR FRACTURES.

Fractures of the Ossa Nasi.

These bones, from their situation, are much exposed to fractures. The fragments are sometimes not deranged ; but, most frequently, they are depressed. In order to replace them, the surgeon must pass a female catheter, a ring-handled forceps, or any such instrument, into the nostrils, and, using it as a lever, push the fragments outwards ; while, with the index-finger of the left hand, he prevents them from being pushed out too far. When the fragments are inclined to fall inwards again, authors advise supporting them with an elastic gum cannula, or lint, introduced into the nostril.

Fractures of the ossa nasi are sometimes attended with very dangerous symptoms ; which may depend, either on the concussion of the brain, produced by the blow, which caused the fracture ; or, on the cribriform lamella and the crista galli of the os ethmoides being driven inward, so as to injure and compress the brain.

When the symptoms of pressure on this viscus exist, (see *Head, Injuries of*) and the ossa nasi are much depressed, the surgeon must immediately raise them, together with the perpendicular process of the os ethmoides, which is connected with the cribriform lamella and crista galli. Perhaps, a pair of closed common forceps introduced into the nostrils, might best enable the surgeon to do what is necessary. In all cases, in which the ossa nasi are broken, bleeding and the antiphlogistic treatment are proper ; for the vicinity of the eye renders it very liable afterwards to become inflamed ; and when

there are symptoms of the brain being also injured, the necessity of such practice is still more strongly indicated.

Fractures of the Lower Jaw.

This bone is sometimes fractured near the chin; but, seldom so as to produce a division of the symphysis of that part, though this is not impossible. In other instances, the fractures occur near the angles of the jaw. The bone may also be broken in two places at the same time; in which event, the middle portion is extremely difficult to keep right, because many of the muscles, which draw the lower jaw downwards, are attached to that part.

The condyles and coronoid processes are also sometimes broken; the former the most frequently.

Fractures of the lower jaw may be either perpendicular to its basis, oblique, or longitudinal: of this latter, examples have been known, in which a portion of the alveolar part, with the teeth in it, was detached from the rest of the bone.

In the present cases, the soft parts are commonly contused and wounded. J. L. Petit mentions a case, in which the bone was broken, and the coronoid process quite denuded, by the kick of a horse.

Fractures of the lower jaw are deranged in the following way. When the fracture is near the symphysis, the side on which the processus innominatus is situated, is drawn downward and backward by the sub-maxillary muscles, while the other fragment is supported by the muscles which close the jaw. When the fracture is more backward, the derangement occurs in the same way, but not so easily. When the bone is fractured in two places, the middle portion is always pulled downward and backward by the muscles attached to the chin, while the two lateral pieces are kept up by the levator muscles. When the ramus of the jaw is broken, the masseter, being attached to both pieces, prevents much derangement. When the neck of the condyle is fractured, the pterygoideus externus may pull the condyle forward.

When a blow is received on the lower jaw, or the bone is injured by a fall, or by the pressure of some heavy body; when an acute pain is experienced in the part, and an inequality may be felt at the basis of the bone; when some of the teeth, corresponding to that inequality, are lower than the others; and when a crepitus is perceptible on moving the two pieces of the jaw on each other; there can be no doubt of a fracture. When the gums are

lacerated, or the bone denuded by a wound, the case is (if possible) still more manifest.

Fractures of the rami and condyles, though not so easily distinguishable, may be known by the great pain felt near the ear; particularly when the jaw is moved, and the crepitus, which the surgeon may discover with his finger.

Fractures of the lower jaw, whether simple, or double, are easily set, by pushing the deranged part upward, and a little forward, and then pressing on the basis of the bone, so as to bring it exactly on a level with the portion which has preserved its natural position. The maintenance of the reduction, however, is difficult; and can only be well executed by supporting the lower jaw, and keeping it applied to the upper one.

As soon as the fracture is set, the surgeon should adapt some thick pasteboard, previously wet and softened with vinegar, to the outside of the jaw, both along its side and under its basis. Over this moistened pasteboard, a bandage with four tails is to be applied, the centre being placed on the patient's chin, while the two posterior tails are to be pinned to the front part of a night cap, and the two anterior ones fastened to a part of the same cap more backward. When the pasteboard becomes dry, it forms the most convenient apparatus imaginable for increasing and supporting the fracture. A piece of soap-plaster may now be applied to the skin underneath, which will prevent any ill effects of the hardness and pressure of the pasteboard.

Until the bone has become united with some firmness, the patient should be allowed only such food as does not require being masticated, which may be given by introducing a small spoon between the teeth a little separated. Indeed he should be recommended to live principally on broths, soups, jellies, &c.

To keep the middle portion of the bone from being drawn downward, and backward, toward the larynx, it is frequently necessary to apply tolerably thick compresses just under and behind the chin; which are to be well supported by the bandages already described.

I need hardly state the necessity of enjoining the patient to avoid talking, or moving the jaw in any manner whatever.

When the condyle is fractured, as it is incessantly drawn forward by the action of the pterygoideus externus; and, on account of its deep situation, cannot be pressed back, the lower portion must, if possible, be pushed into contact with it. For this purpose, the bandage must be

made to operate particularly on the angle of the jaw, where a thick compress should be placed.

Compound fractures of the lower jaw, are to be treated on the same principles, as such injuries of other bones. The external wound should, if possible, be healed by the first intention; and, when this attempt fails, care must be taken to keep the wound clean by changing the dressings about once in three days: oftener would disturb the fracture too much. It is observed, that compound fractures of the jaw, and even simple ones, which are followed by abscesses, are particularly liable to be followed by troublesome and tedious exfoliations.

In very bad fractures, in which all motion of the jaw must have the most pernicious effect, it might even be prudent to administer every kind of nourishment in a fluid form, through a hollow bougie, introduced from one of the nostrils down the œsophagus.

Fractures of the Vertebrae.

The shortness and thickness of these bones do not render them very apt to be broken. The spinous processes, which project backwards, are the most exposed to such an injury; for they are the weakest and most superficially situated. The violence, which is great enough to break the vertebrae, must produce a greater, or less concussion, or other mischief, of the spinal marrow; from which accident much more perilous consequences are to be apprehended, than from the injury of the bones, abstractedly considered. The displaced pieces of bone may press on the spinal marrow, or even wound it, so as to occasion a paralytic affection of all the parts, which derive their nerves from the continuation of this substance below the fracture.

As the mere concussion of the spine may occasion symptoms, which very much resemble those, which usually occur, when the vertebrae are fractured, the diagnosis is certainly very obscure. Perhaps, an inequality in the line of the spinous processes might be observed. The lower extremities, and the rectum, and bladder, are generally paralytic; the patient is afflicted with retention of urine and feces, or with an involuntary discharge of the latter. (*Boyer.*)

Fractures of the spinous processes, without any other serious mischief, are not dangerous; and are the only instances of fractures of the vertebrae, which admit of being ascertained with certainty.

Any attempt to set fractures of the bodies of the vertebrae, even were they

known to exist, would be both useless and dangerous. General treatment can alone be employed. Cupping will tend to prevent inflammation in the situation of the injury. When the patient is affected with a flatulent distention of the abdomen, vomiting, hiccough, &c. the belly may be rubbed with a camphorated liniment, and purgative clysters, and anti-spasmodics, given. If requisite, the urine must be drawn off with a catheter. The removal of the paralysis of the bladder, rectum, and lower extremities, if it should be inclined to take place, ought to be promoted by rubbing the back, loins, sacrum, and the limbs, with liniments containing the tinct. canthar. (*Boyer.*)

Some authors recommend trepanning, or cutting out a portion of the fractured bone, when the compression of the spinal marrow, or its injury by a splinter, is suspected: but, exclusively of the difficulty of that operation, on account of the great depth of the intervening soft parts, the indication is never sufficiently evident to authorize it. (*Boyer.*)

A fracture of the upper cervical vertebra, or of the processus dentatus, is always suddenly fatal. In such cases, the paralysis of the diaphragm, immediately produced, affords ample cause for instantaneous death.

Fractures of the Sternum.

When these accidents occur, the fractured portions may be driven inward so as to wound the pericardium, heart, or lungs; and a considerable quantity of blood may be extravasated from ruptured vessels, and collect in the anterior mediastinum. Such an effusion, however, does not cause symptoms so urgent as those, which blood extravasated beneath the cranium produces.

The symptoms of a fracture of the sternum are, inequalities of the bone; a depression, or elevation of the broken pieces; a crepitus and an unusual moveableness of the injured part in respiration; the breathing is frequently difficult, and almost always accompanied with a cough, spitting of blood, palpitations, and inability to lie on the back. According to the observations of Petit and Baldinger, several of these latter symptoms may continue with less intensity, a long while after the fracture is cured. See *Levéillé's Nouvelle Doctrine Chirurgicale. Tom 2. p. 248.*

Fractures of the sternum, when mere solutions of continuity, only require common treatment; viz. a piece of soap-plaster to the situation of the injury, a

roller round the chest, quietude, and, in particular, bleeding, with a view of preventing, what may be considered as the most dangerous consequence, inflammation of the parts within the chest.

In cases, attended with great depression of the fractured bone inward, the necessary incisions should be made, in order to raise with an elevator the portions of the bone driven inward, or extract with forceps any loose splinters, which seem to be similarly circumstanced. It is not often necessary to trephine the sternum, either to raise a depressed portion, or to give vent to extravasated fluid. Such an operation, however, may occasionally be proper, either in the examples specified, or when the bone becomes carious, and the diseased part is exceedingly tedious in separating.

Fractures of the sternum are more frequently produced by gun-shot violence, than any other cause, and, in these cases, there will generally be many splinters, which will require extraction. At the battle of Marengo, the French general Champeux received such a wound, with which he lived nearly a month: the injury was attended with so many splinters, that, when they were removed, the pulsations of the heart, were visible to a considerable extent. (*Levêillé op. cit. Tom. 2, p. 244.*)

The ensiform cartilage when ossified in old subjects, is liable to be fractured. Little more, however, can be done in such a case, than relaxing the abdominal muscles by raising the thorax and pelvis, and then applying a piece of soap-plaster and a roller over the part, for the purpose of keeping it steady. When the blow has been violent, the patient should always be bled.

Fractures of the Ribs.

These generally happen near the greatest convexity of the bones, several of which are often broken together. The first rib, being protected by the clavicle, and the lower ones being very flexible, are less liable to be fractured, than the middle ones.

When a spicula of a fractured rib is beaten inward, it may lacerate the pleura, wound the lungs, and cause the dangerous train of symptoms attendant on emphysema. (*See Emphysema.*)

A pointed extremity of the rib, projecting inwards, may also cause an extravasation of blood; or, by its irritation, produce inflammation in the chest. A fracture, which is not at all displaced, is very difficult to detect, particularly in fat subjects; and, no doubt, is very frequently

never discovered. The surgeon should place his hand on the part, where the patient seems to experience a pricking pain in the motions of respiration, or where the violence has been applied. The patient should then be requested to cough, in which action the ribs must necessarily undergo a sudden motion, by which a crepitus will often be rendered perceptible. All the best practitioners, however, are in the habit of adopting the same treatment, when there is reason to suspect a rib to be fractured, as if this were actually known to be the case, by the occurrence of a crepitus, or the projection of one end of the fracture; which, indeed, in instances, which are displaced, makes the nature of the accident sufficiently plain.

A broken rib cannot be deranged either in the direction of the diameter of the bone, nor in that of its length. The ribs, being fixed posteriorly to the spine, and anteriorly to the sternum, cannot become shortened. Nor can one of the broken pieces become higher, or lower, than the other, because the same muscles are attached to both fragments, and keep them at the same distance from the neighbouring ribs. The only possible derangement is either outward, or inward. (*Boyer.*)

Simple fractures of the ribs, free from urgent symptoms, require very simple treatment. The grand object is to keep the broken bones as motionless as possible. For this purpose, after applying a piece of soap-plaster to the side, and over it proper compresses; a broad linen roller is to be firmly put round the chest, so as to impede the motion of the ribs; and compel the patient to perform respiration chiefly by the descent and elevation of the diaphragm. A scapulary will prevent the bandage slipping downwards. When the fractured part seems depressed inward, the compresses should be placed on the anterior and posterior part of the bone. As a roller is very apt to become slack, many surgeons, with good reason, never employ one in the present case; but take a piece of strong linen, large enough to surround the chest, and lace it with packthread, so as to compress the ribs in the necessary manner.

When there is reason from the symptoms to think the lungs injured, or disposed to inflame, copious and repeated bleedings should be practised. Indeed, as peripneumony is always apt to succeed the accident, and is a most dangerous occurrence, every person free from debility, either having a broken rib, or supposed to have such, should always be bled in the very first instance. The spermaceti mixture, with opium, is an excel-

lent medicine for appeasing any cough, which may disturb the fracture, and give the patient infinite pain.

Fractures of the Sacrum.

These accidents do not often occur; and, when they do, must be occasioned by some powerful cause, such as the fall of a very heavy body, or the passage of a carriage wheel on the convex side of the bone, or a fall from a great height on that part. No muscle tends to derange the position of the broken portions. Indeed, the principal danger depends on the injury, which the pelvic viscera may have suffered from the violence which broke the bone. To prevent the inflammation of such parts, of course, antiphlogistic means, particularly bleeding, are highly proper. Another source of grievous complaints, occasionally arising from fractures of the sacrum, is the injury done to the sacral nerves. Hence often proceed, retention of urine, inability to retain this fluid, involuntary discharge of the feces, paralysis of the lower extremities, &c.

With respect to the relief of these symptoms, we need add nothing to what we have already said on the subject, in speaking of fractured vertebræ. The reader must also refer to the articles, *Urine, Retention of; Incontinence of, &c.* Should the lower portion of the sacrum be displaced inward by the force applied, it is to be reduced in the same way as the os coccygis. With regard to the particular means for promoting the union of the fractured sacrum, all that can be done is to apply a piece of the emplastrum saponis to the part, and put a roller round the pelvis, or a T Bandage.

Fractures of the Os Coccygis,

Though much slighter than the sacrum, it is less frequently broken. Its not being much exposed to external force, and its moveableness, are the reasons of this. When the os coccygis is fractured by a fall on the buttock, the pain, arising from the accident, is increased by walking, in consequence of some fibres of the glutei being attached to this bone, and disturbing it when in action. (*Boyer*)

When the detached piece of bone is driven inward, the surgeon is to introduce his fore-finger, previously oiled, into the rectum, and, with the assistance of the fingers of his other hand externally, he is to reduce the displaced part. This being accomplished, little more can be done, than applying a piece of soap-plaster to the injured part, together with

a T bandage; adopting the antiphlogistic regimen, and enjoining the patient to avoid lying on his back, or sitting down. He should also avoid walking, so as to put the glutei muscles into action, which would disturb the broken bone.

Fractures of the Ossa Innominata.

Such cases are not common; and, when they happen, are generally produced by the passage of heavy carriage wheels, over the pelvis; and are always attended with considerable contusion of the external soft parts, and sometimes with great injury of the pelvic viscera. The anterior superior spinous process has been broken off, by the kick of a horse. (*Boyer.*)

In St. Bartholomew's hospital, several instances occurred, during my apprenticeship to Mr. Ramsden, in which the os ilium, os ischium, and os pubis, were found fractured on opening the bodies after death; and, when we consider the great violence necessary to produce such accidents, we cannot wonder that the injured state of the pelvic viscera should frequently prove fatal. The fractures themselves are seldom displaced, so that what relates to their treatment is exceedingly simple, merely consisting in applying a roller round the pelvis, and putting a piece of soap-plaster on the broken part. The grand indication is to obviate the consequences of inflammation of the parts within the pelvis, and even of the peritonæum and abdominal viscera, by copious and repeated blood-letting. Any complaints respecting the evacuation of the urine and feces, must also be attended to. When the contusion is excessive, and the bones very badly broken, the patient cannot move nor go to stool, without suffering the most excruciating pain. To afford some assistance in such circumstances, *Boyer*, in a particular case, passed a piece of strong girth web under the pelvis, and, collecting the corners into one, fastened them to a pulley suspended from the top of the bed. This enabled the patient to raise himself with very little effort, so that a flat vessel might be placed under him. Certainly, a bed on the principles recommended by Sir James Earle, might be of infinite service, both in these cases, as well as in many others, particularly compound fractures and paralytic affections from diseased vertebræ. (*See Observations on Fractures of the Lower Limbs; to which is added, an account of a contrivance to administer cleanliness and comfort to the bed-ridden; by Sir J. Earle, 1807.*)

Sometimes, notwithstanding the rigor-

ous adoption of antiphlogistic measures, abscesses cannot be prevented from forming in the pelvis, particularly, when there are detached splinters driven inwards. Such splinters may wound the bladder, and cause an extravasation of urine. Desault extracted a splinter, which had done so, from the bottom of a wound, which he had made to give exit to the effused urine. In these cases, a catheter should be kept introduced to prevent the urine from collecting in the bladder, and afterwards insinuating itself into the cavity of the abdomen. (*Chapart.*)

Fractures of the Thigh.

To this subject I shall allot as much room as the work will possibly afford, because it is one, which strongly claims the consideration of modern surgeons, and may be deemed even yet unsettled; the illustrious Pott defending one method of treatment; the celebrated Desault another.

The os femoris is liable to be broken at every point, from its condyles to its very head. It is, however, at the middle third of this extent, that fractures mostly occur. The fracture is sometimes transverse, but more frequently oblique. The latter direction of the injury makes a serious difference in the difficulty of curing the case, without future deformity, or lameness. Sometimes the fracture is comminuted, the bone being broken in more places than one; and sometimes the case is attended with a wound, communicating with the fracture, and making it, what is termed, *compound*. As Petit remarks, however, the thigh-bone is less seldom broken into several pieces, than others more superficially situated.

A fractured thigh is at ended with the following symptoms; a local acute pain at the instant of the accident; a sudden inability to move the limb; a preternatural mobility of one portion of the bone; sometimes a very distinct crepitus, when the two ends of the fracture are pressed against each other; deformity, in regard to the length, thickness, and direction, of the limb. The latter change, viz. the deformity, ought to be accurately understood; for, having a continual tendency to recur, especially, in oblique fractures, our chief trouble in the treatment is to prevent it. (*Desault, par Bichat.*)

Almost all fractures of the thigh are attended with deformity. When this is considered, in relation to length, it appears, that, in oblique fractures, the broken limb is always shorter than the opposite one; a circumstance denoting, that the ends of the fracture ride over

each other. We may also easily convince ourselves, by examination, that the deformity is owing to the lower end of the fracture having ascended above the upper one, which remains stationary. What power, except the muscles, can communicate to the lower portion of the fractured bone, a motion from below upwards? At one end, attached to the pelvis; and, at the other, to this part of the bone, the patella, the tibia, and fibula, they make the former insertion their fixed point, and drawing upward the leg, the knee, and the lower portion of the thigh, they cause directly, or indirectly, the derangement in question. In producing this effect, the triceps, semitendinosus, semimembranosus, rectus, gracilis, sartorius, &c. are the chief agents.

To show the power of the muscles to displace the ends of such fractures, mention is made, in Desault's works by Bichat, of a carpenter, who fell from a scaffold, and broke his thigh. The limb, the next day, was as long as the other; but, the man had a complete palsy of his lower extremities, and could not discharge his urine. The moxa was applied, and the muscles soon regained their power, and then the shortening of the limb began to make its appearance.

Besides the action of muscles, there is another cause producing a derangement of the fracture, in the course of the treatment.

How firm soever the bed may be on which the patient is laid, the buttocks, more prominent than the rest of the body, soon form a depression in the bedding, and thence follows an inclination in the plane on which the trunk lies; which, gliding from above downward, pushes before it the upper end of the fracture, and makes it ride over the lower one. The muscles, irritated by the points of bone, increase their contraction, and draw upward the lower part of the bone; and from this double motion of the two ends of the fracture in opposite directions, their riding over each other results. (*Desault, par Bichat.*)

Transverse fractures are less liable to be displaced in the longitudinal direction of the bone, because, when once in contact, the ends of the fracture form a mutual resistance to each other; the lower one, drawn upward by the muscles, meets with resistance from the upper one, which itself inclined downward by the weight of the trunk, pushes the former before it, and thus both retain their position in relation to each other.

The deformity of a fractured thigh, in the transverse direction, always accompanies that which is longitudinal; but,

sometimes, it exists alone. This is the case, when, in a transverse fracture, the two ends of the bone lose their contact; one being carried outward, the other inward; or, one remaining in its place, while the other is separated. The upper end of the fracture is not now, as in the foregoing instance, motionless in regard to the muscular action; the contraction of the pectineus, psoas, iliacus internus, and upper part of the triceps, deranges it from its natural direction, and contributes to displace it.

The deformity of the limb, in regard to its direction, is either the consequence of the blow, which produced the fracture, or, what is more common, of the ill-directed exertions of those who carry the patient. Thus we see that an injudicious posture bends the two portions, so as to make an angle. (*Desault, par Bichat*)

Whatever may be the kind of deformity, the lower end of the fracture may retain the natural position in which it is placed, or else undergo a rotatory motion on its axis outward, which is very common, or inward, which is more unusual. This rotation always aggravates the displaced state of the fracture, and should be attended to in the reduction. (*Desault, par Bichat*)

Having presented the reader with these accurate remarks on the kinds of derangement, to which fractured thighs are subject, I shall beg his attention to a few observations of my own, on Mr. Pott's account of the effects of posture on fractured limbs; on what constitutes the chief displacement of a broken thigh, and what muscles can principally produce this effect; and, lastly, on the actual condition of such muscles in the bent position of the limb.

1. Almost every one initiated in the surgical profession, imbibes a vague kind of information, that relaxation of the muscles, both in the reduction, and during the whole cure of fractures, was what Mr. Pott most strenuously recommended as the proper condition, in which those powers ought to be placed, under such circumstances; and was what he had in view in adopting the bent position for a fractured thigh.

The love of truth, leads me, however, to remark, that this eminent surgeon has not availed himself of the light, resulting from anatomical enquiries, to elucidate the effects of posture upon fractured limbs. Though many practitioners may now feel persuaded, how much greater the advantages are in the bent, than in the straight posture of the limb, in the case of a broken thigh; yet, few are so well ac-

quainted with the exact reasons why, and precise manner, how, those advantages arise. It is true, as already stated, it is known in a vague manner, that the advantages alluded to, arise from the relaxation of muscles connected with the fractured bone; Mr. Pott contents himself with making mere assertions to this effect, and supporting them upon an appeal to experience, leaves the rationale of the subject in perfect obscurity. When we have practical evidence in favour of any adoption, and when, at the same time, no rational theory can be formed to coincide with it, certainly, it behoves us to follow the more useful dictates of the former, and to beware of any dangerous hypothesis into which too eager a pursuit of the latter might allure us. When numerous surgeons, however, are in a state of indetermination, nay, what is more urgent, when one half of the profession seems to be at variance with the other upon a point important to be decided, and without the prospect of approaching harmony of practice, what resource remains, but that of reason, to instil into the mind those facts and principles, by which all must be governed; and, from a due observation of which, only one opinion and practice would result? To rest contented with barely knowing, that the superior utility of the bent posture, in the case of a broken thigh, proceeds from the relaxation of muscles, is to remain in a certain state of ignorance, from which, by an unfettered exercise of our own intellects, we might possibly disengage ourselves. Nor will any man of reflection contend that information so naked, so void of illustration, is enough to saturate with full conviction that philosophical spirit of enquiry, from which the present enlightened state of medical science is so eminently derived. And might it not tend to advance, and very usefully to improve our knowledge of the subject, if we could ascertain more accurately upon what principal the posture of the limb ought to be selected with the greatest possible advantage to the patient? Until that is accomplished, we are acting as mere surgical automata; without true science, and without a ray of judgment. Neither will it be satisfactory to answer, that posture is to be determined upon the principle of relaxing the majority of the muscles connected with the broken bone. More is essentially required to make the solution in this way accurate; for, even admitting, what some may be inclined to doubt, that the bent position does relax more muscles than the straight one, its precision will vanish, when we shall have explained,

that certain muscles, moving the thigh-bone, possess much greater power to impede the favourable coaptation and union of the fracture, than others performing the same office, and of not inferior bulk. I am humbly of opinion, that those practitioners, who still adhere to the old plan of placing fractured thighs in the straight posture, have never been struck with this distinction; and, in contending that their mode of treatment relaxes as many muscles connected with the broken bone as the opposite one, they have not reflected upon what constitutes the relative displacement of the two ends of the fracture. I have heard it more than once remarked, that what Mr. Pott terms the relaxed position of the limb, cannot really merit that application, because there are, perhaps, as many muscles thrown into a state of tension into this very posture, as in the straight one. According to my ideas, there is some reason in this criticism; but no one must thence infer, that the straight position is equally proper; for, provided we shall be able to make out the truth of what has been delivered above, the question under consideration will be much altered; and, instead of inquiring, "Are more muscles relaxed in the bent, than in the straight position?" we must enquire, "Are more of those muscles, *possessing most influence over the fracture*, relaxed in this or that position of the limb?"

Were we to resign the privilege of thinking for ourselves, and implicitly to mould our opinions, according to any authority, however high, we should often fall into very avoidable errors. Were we to believe the literal sense of several passages in Mr. Pott's remarks upon Fractures, we should suppose it possible and practicable to relax at once, by a certain posture of the limb, every muscle connected with a fractured bone. In the first vol. of his works, page 389, edit. 1783, he observes, in speaking of what must best answer the purpose of incapacitating the muscles from displacing the fracture: "Is it not obvious, that putting the limb into such position as shall relax the whole set of muscles, belonging to, or in connexion with, the broken bone, must best answer such purpose?" and, in the next page, "What is the reason why no man, however superficially acquainted with his art, ever finds much trouble in setting a fractured os humeri; is it not both because patient and surgeon concur in putting the arm into a state of flexion, that is, into such a state as relaxes all the muscles surrounding the broken bone?" Also in page 393, he continues, "Change of posture must be the remedy, or rather the placing

the limb in such manner as to relax all its muscles." That to have all the muscles relaxed in cases of fracture would be desirable, were it also practicable, every one will admit; but the possibility of accomplishing it, so long as different muscles have different uses, different situations, and different attachments to the bones, every one must grant to be no more than visionary. For instance, do not the patient and surgeon, in the case of fractured os humeri, adverted to above, rather concur in putting the fibres of the triceps and anconeus into a state of tension, at the same moment that they relax the biceps and brachialis internus?

In short, the indetermination of many practitioners, with regard to the greater propriety of placing a fractured thigh-bone in the bent, than in the straight position, must, in a great measure, be attributed to the imperfect explanations, hitherto offered of the way, in which the former becomes more advantageous than the latter; especially, if it be true, that a comparative and fair trial in practice would shew, that the bent posture is in no respect inferior to the straight one, and will even succeed in many instances, where deformity, shortening of the limb, and lameness, would be inevitable consequences of the other.

2. By what I am now going to remark, I do not mean to question the accuracy of Desault's account of the various kinds of derangement to which a broken thigh is liable. The rising end of the bone has now been put into its proper point of view, and even ordinary practitioners are well aware of the erroneous ideas once entertained concerning it, and the more pernicious treatment often had recourse to in consequence. In the fractured thigh, the rising end of the bone is the upper extremity of the fracture, that which is connected with the hip, that which is truly in its right and natural situation, and that which no surgical means can therefore possibly alter for the better. On the other hand, the lower end of the fracture, or that which is connected with the knee, is that which is displaced, that which is drawn more or less underneath the other extremity of the bone, and that which well-directed surgery can generally set right again.

No doubt can, I think, exist about the accuracy of these preceding propositions, when we consider, that the superior portion of the broken bone is properly articulated with the acetabulum; that its broken extremity is neither removed farther from, nor nearer to, that cavity than nature placed it; that the position, in which the upper portion of the broken os

femoris is found, is not in the least deranged, and precisely such as it has oftentimes been put into previously to the occurrence of the accident. But, the lower end of the fracture is not only wrong in relation to the upper end, it is out of its due situation in all other respects; it is drawn upward nearer to the pelvis than it ever could be naturally, and hence the limb is shortened; the position, in which it is constantly found, is so deranged, in relation to the pelvis, its axis is so altered, that even were we to overleap the bounds of possibility, and to suppose the upper end of the fracture brought into apposition with it so situated, we should at the same time be obliged to construct in our wanton imagination a new acetabulum, differently situated from the natural one for the reception of the head of the bone; or, perhaps, it might best suit such chimera to alter the ordained shape of the thigh-bone. The deviation from the natural and relative situation of the two ends of the fracture, it is then my wish to imply, proceeds, not from any derangement of the upper portion, but, from a retraction of the inferior part of the broken bone.

If it be received as an irrefragable truth, that the upper extremity of the fracture is not out of its due situation, and that the lower end is so, it must necessarily follow from the admission of this principle, that the first grand indication in the management of the case, is to put the lower end of the fracture into its right and relative situation, by drawing it downward, and placing it in as perfect apposition, as the nature of circumstances will allow, and not to make any vain attempts to press down the prominent end of the bone; a thing altogether impracticable and highly improper.

Let us now suppose, that the surgeon proceeds to replace the lower end of the fracture, which we have described as being retracted, more or less, underneath the other.

Mr. Pott has judiciously remarked, that to impede the accomplishment of this purpose, little or no difficulty can arise from the fracture itself, the broken ends of the bone being of themselves inactive. The muscles must be looked upon as those powers, which can, and do make opposition to the reduction of the fracture; and, when set right, to its continuing so. The muscles alone are the powers causing the retraction of the bone and shortening of the limb.

It is well, and universally known, that muscles can only contract to a certain length; and, it is upon a knowledge of this fact, that the principle and utility of

relaxing their fibres are founded; for, in proportion as they become relaxed by the approximation of their attachments, they are partly deprived both of their disposition and power to act. What then is implied by relaxation of a muscle is most simple of comprehension; it is that condition, in which its origin and insertion are more or less approximated to each other.

We shall now enquire, what muscles are so circumstanced as to be capable of making most resistance to the reduction and coaptation of the fracture; for, should we succeed in ascertaining them with precision, it must be a primary consideration to relax them, rather than any others, less empowered to do harm; and, after what has been delivered, it seems a most easy matter to determine them.

That those muscles, destined to move the os femoris, and affixed only to part of this bone above the situation of a fracture, cannot make any opposition to its reduction, nor principally disturb the coaptation; and that, therefore, their relaxation is not what the skilful surgeon ought primarily to aim at, appear to my mind two very manifest propositions arising from the facts already premised.

But, that he ought to aim principally at the relaxation of those muscles which can concur to retract the lower end of the fracture; all which must necessarily have their insertions below the breach of continuity in the bone, appears to me a fact equally obvious; and, is what I think not unworthy the attentive consideration of all practical surgeons.

My sentiments, however, are not at all repugnant to Desault's description of the derangement; for, I would not take upon me to deny altogether a circumscribed power in muscles attached only to the superior portion of the broken bone to affect the fracture unfavourably, especially, when such fracture is of the transverse kind. It is possible, that they may do so in a limited degree; though, I am inclined to believe, that, in the bent posture, their power of acting injudiciously must be so trivial, as to be unworthy of serious notice. The reasons, for my entertaining this opinion, I shall explain.

When a transverse fracture is reduced, and its broken extremities are placed in even apposition with each other, it is possible to conceive, that the first deviation from the proper situation of the two ends of the fracture, may arise from the contraction of some muscles, that has only a power of moving the upper portion of the bone, and that, in consequence of the superior end of the fracture being moved, and its resistance taken away, the inferior

end may become more easily retracted. This idea, however plausible it may at first appear, will, upon mature consideration, be found in no degree to militate against the opinion advanced, *that the muscles attached to the lower portion of the broken bone have most influence over the fracture*; and it is at once obvious, that, without the action of these latter muscles, no retraction of the lower end of the fracture could take place, into whatever position the other might be drawn by the contraction of other muscles. I am also of opinion, that most of those fractures of the thigh, which I have seen, have been oblique, and the ample experience of Pott and Desault seems to have made them of a similar sentiment. Whether this remark be true to the extent which I have stated, or not, it must at least be granted, that, in oblique fractures of the thigh, the resistance made by the upper end of the fracture to the retraction of the lower, will not be effectual enough to defeat the continual tendency of the muscles to produce that effect. It seems rational to suppose, that those few instances, where little difficulty is experienced in maintaining the fracture in a proper state of coaptation, and where no retraction happens, are cases of the transverse kind, and, consequently, if in such rarer instances alone, and in such instances as consequently end well, the muscles attached above the fracture can do harm, it is not of so much importance. Besides, admitting (what indeed I have already admitted) that, in transverse fractures of the thigh, the resistance made by the upper end of the fracture to the retraction of the lower, becomes of considerable utility, it is evident, that it becomes so only by counteracting the action of those muscles, which tend to draw upward the inferior portion of the fractured bone. Were it only in our power effectually to incapacitate them by posture, or any other means, oblique fractures of the thigh would be no more difficult to unite favourably, than transverse ones. The majority of cases also being oblique, and these being such as so often baffle the surgical art, we can only rely upon our means of diminishing the power of muscles to retract the inferior portion of the fractured bone for the accomplishment of a good cure.

In the bent position of the limb, let me also enquire, in what direction can the superior end of the fracture be first drawn by the action of muscles? The flexors of the thigh being relaxed, we cannot suppose, that they make it project forward, as it actually does, or at least has done in every instance of displacement

that I have yet seen. It may be suggested, that the adductor muscles may do so; but, as these ought also to be perfectly relaxed in the bent position, they cannot, when the bone is set right, and placed as circumstances demand, do what we are considering.

The glutei are tense, and may therefore be conceived capable of disturbing the coaptation; but, to appeal to fact, and the incontestable evidence of experience, do we ever find the upper end of the fracture situated either behind, or on the outside of the lower end? Do we not constantly find it projecting in front, and the latter drawn up more or less behind it? Even supposing the upper end of a transverse fracture were first drawn in a direction backward, would it not rather tend to prevent retraction of the lower end, according to the manner in which it is uniformly found to be displaced? In short, we can account for every thing, relating to the displaced condition of the fracture, without having recourse to the doctrine admitting much influence over the fracture to reside in muscles attached only to the superior portion of the fractured bone. If, at the same time, we concede, for the sake of a reconciliation of opinions, that muscles inserted into the os femoris, above the situation of a fracture, may act in some degree unfavourably to its union, it yet remains a manifest and unshaken truth, that since no posture of the limb will at once relax all its muscles, it is the duty of the surgeon to select that one, which brings with it the greatest share of advantages, and which disarms, as it were, those muscles, endued with most power to disturb the union of the fracture.

What renders the foregoing remarks more deserving attention is, that the majority of fractures of the thigh-bone happen at some point below the attachment of the gluteus maximus, and that the majority of the muscles, inserted directly into the os femoris, have their attachments so high, that they cannot be supposed to possess great influence over fractures situated at any point much below the trochanters. The psoas magnus and iliacus internus, the glutei, and all the rotators of the thigh-bone outward come within this description, together with, the pectinalis, the superior fibres of the adductor magnus, and all the adductor brevis.

What muscles now remain to antagonize so powerfully the endeavours of the surgeon? In this general view of the subject, the greater part of the triceps will be the only power, inserted immediately into the os femoris, possessing considerable influence; yet, there are several

other very bulky muscles, concerned in the motions of the knee-joint, which may combine very forcibly to retract the lower end of the fracture, and thus resist the reduction and disturb the coaptation, and union of the bone.

Such are the extensor muscles of the leg, especially, the rectus, as we presently shall explain, and the flexor muscles, sartorius, gracilis, semimembranosus, semitendinosus, and biceps. If these are really the muscles, capable of exerting themselves, with most effect, in producing the difficulties accompanying the treatment of all those fractures of the thigh, which happen below the tendon of the gluteus maximus, it certainly becomes a matter of considerable importance to observe, if possible, their relaxation, rather than that of any other set of muscles, less empowered to do harm.

When the fracture is above this point, other muscles come into power, and hence the difficulties augment.

3. In noticing the condition, into which the above muscles are put in the bent position of the limb, we shall, as occasion requires, mention those circumstances, which diminish, or increase, their influence over the fracture.

The triceps is the principal adductor of the thigh; it may also, from the nature of its attachments, combine to bring the thigh-bone forward, and hence, bending the thigh must in a certain degree contribute to its relaxation. It is probable, that of all the muscles capable of impeding, with the greatest effect, the setting of a broken thigh, the triceps) is that, which possesses the highest share of power considering its vast bulk, and its extensive insertion in the bone. Its perfectly relaxed state cannot, therefore, be too particularly insisted upon; it is not enough for this purpose, to bend the thigh upon the pelvis; this alone can only produce a very partial relaxation of its fibres.

The patient ought to be placed upon a firm mattress, and, as he lies upon his side with his thigh bent to an acute angle with the trunk, the pelvis is to be turned completely upon its lateral part, and the fractured bone somewhat raised by pillows. Thus the os pubis and os ischium (from which the three heads of the triceps arise) will become approximated to the linea aspera, and the ridge above the internal condyle of the os femoris (into which they are inserted) as much as circumstances will permit, and thus the relaxation of the muscle will be effected.

The pectinalis can only be a primary power in disturbing the fracture, when the accident has occurred very high up.

As it is an assistant both in the flexion and adduction of the thigh, it must be relaxed in the above position. I need only observe further respecting it, that the majority of fractures happen below its insertion, and, consequently, in such instances, it will, with the upper fibres of the triceps, possess no power of displacing the lower end of the fracture.

The next muscles, claiming our attention, are the extensors of the leg.

In considering the effect of the action of different muscles upon a fractured thigh-bone, it is useful to carry in our mind the precise direction in which the inferior end of the fracture is displaced. We should bear in our recollection, that it is drawn up more or less behind the upper portion of the bone; and muscles, which can most concur to produce such retraction, are those, which can most impede the favourable union of the fracture. The situation of the extensor muscles of the leg at once suggests to us, that they cannot produce this effect nearly in so great a degree as the flexors. It is true, that the sartorius is situated in front of the thigh, and has been enumerated as possessing much influence over the fracture; but, it is to be remembered that the direction of its force is entirely changed in consequence of its spiral course, and its passing behind the internal condyle of the os femoris. The rectus may undoubtedly aid in the retraction of the lower end of an oblique fracture: its power to disturb a transverse one seems doubtful. Being a loose muscle, not attached to the thigh-bone, and acting only from two points very remote from each other, viz. the anterior inferior spine of the ilium and the patella, it can on this account exert the strength of every fibre, both above and below the breach of continuity in the bone, in combining to retract the inferior end of an oblique fracture. The vasti and cruralis, on the contrary, being muscles intimately attached to the os femoris, and having no origin whatever from the pelvis, can only employ the force of those fibres, which happen to be situated above the fracture in aiding to retract the lower portion of the broken bone. For instance, supposing the fracture to be situated about the middle of the thigh, all those fibres of the vasti and cruralis deriving their origin from the os femoris below the breach of continuity in the bone, and inserted into the patella, can obviously have no effect in producing the retraction and displacement of the inferior end of the fracture. This fact must considerably lessen the influence of these three extensors in acting injuriously toward fractures.

There are yet other circumstances, which must tend to diminish their power. If we reflect upon the lower end of the fracture, when displaced; if we remind ourselves, that it is constantly drawn up behind the other; it must immediately strike us, that the vasti and cruralis, the fibres of which embrace and adhere so intimately to the surface of the bone, both above and below the fracture, must be more or less detached from their origin, in proportion to the degree of retraction and displacement; that the fibres of the vasti, taking their origin from the lower part of the linea aspera above the fracture, must in all probability be detached from such connexion by the retraction of the lower end of the fracture in that situation: and that the fibres of the cruralis must at the same time be partially detached from their intimate connexion with the anterior surface of the bone below the fracture. Such separated fibres can exert no power over fractures. When we also reflect, that the fibres of the cruralis and the anterior ones of the vasti must inevitably be more or less stretched round the upper end of the fracture, by which the direction of their force upon the lower end must be so changed, that, instead of tending to draw it upward, they can only pull it forward, I think it must be granted that their faculty of materially disturbing a fractured thigh is involved in doubt. The rectus is certainly to be considered, in every respect, as one of the primary powers acting in the displacement of fractures, and, as such, it ought to be perfectly relaxed, if other considerations should not forbid it; that is, if we should not throw a larger bulk of muscular fibres, disposed to act unfavourably on the fracture, into a state of tension, by observing its perfect relaxation, than we should, by such means, relax, and according to our principles, this would undoubtedly happen. Consequently, in the bent position of the limb, though we do not completely relax the rectus, since, the knee is bent, at the same time that the thigh is in a state of flexion, yet we must, of necessity, be content with a partial relaxation of its fibres, for the sake of relaxing a more powerful set of muscles next to be considered. It may not however be inapplicable to state, that in the bent position, the anterior inferior spine of the ilium is almost, if not quite, as near to the patella as in the straight one, and of course even the rectus must be equally favoured in point of relaxation. The vasti and cruralis are tense in the bent position; but, I cannot consider their power over the generality of fractures to be of primary im-

portance. The higher the fracture is situated, the less can they exert that little share of influence which they may be supposed to possess; and accidents of this description, when in a high situation, being always the most troublesome, is a circumstance proving, that it is to other powers we ought to attribute the augmentation of difficulty.

The flexor muscles of the leg, above enumerated, are capable of acting very powerfully in resisting the reduction, and disturbing the coaptation of the fracture. For the sake of surveying them more clearly in this surgical point of view, they may be divided into two classes. The first comprehends two muscles arising from the pelvis in front, viz. the gracilis and sartorius, which are favoured in all respects by the bent position of the limb, as well by flexion of the thigh, as by that of the leg; and also in a very important degree by observing to place the pelvis strictly upon its side, and to raise the thigh by proper pillows. The second class consists of three muscles coming from the tuberosity of the ischium behind, viz. the semimembranous, semitendinosus, and long head of the biceps, being such as are only favoured, with a view to relaxation, by flexion of the knee.

That the sartorius and gracilis are in every respect favoured by the bent posture, no one acquainted with the origins and insertions of those muscles; no one knowing the effect of their action, will feel inclined to deny; and presuming upon the admission of this truth, I shall pass on to reflect upon the state of the three other flexors enumerated above.

In deriving their origin from the tuberosity of the ischium, they acquire a power of contributing to draw the limb backward, as well as of bending the knee. Hence, their perfect relaxation is obviously unaccomplished in the bent position. One might even conjecture *a priori*, that they are little, or not in the least, benefited in such condition, because bending the thigh may seem to counteract all the good effect, in regard to relaxation, resulting from flexion of the knee. Measurements on the skeleton, however, will shew, that the tuberosity of the os ischium is approximated considerably more to the heads of the tibia and fibula in the bent, than in the straight posture. I may also take the liberty of remarking, that horizontally situated, as the thigh-bone is in the straight position, it cannot be regarded, as affording an equal degree of relaxation to such muscles, as if it actually were in a state of perfect extension. The short head of the biceps will, in many instances,

be enabled to assist in the retraction of the inferior end of the fracture, and it is manifestly relaxed in the bent position. I am not inclined to allow any share of power to reside in the popliteus.

Daily experience justifies my laying it down, as a fact, that the higher the fracture is situated, *ceteris paribus*, the greater is the difficulty experienced in keeping it in a state of apposition. In contemplating the subject, upon the principles advanced in the preceding remarks, we immediately discern the reason of it. When the fracture is very high, almost the whole of the triceps and pectinalis concur to retract the bone. When immediately below the trochanters, the gluteus maximus is to be added to the numerous class of muscles, capable of disturbing the union of the fracture. When in the neck of the bone, the multitude of muscles, inserted into the two trochanters, become enabled to assist in the retraction and displacement of the main portion of the bone. Hence, the immense difficulty to be surmounted in accomplishing the union of such cases, without shortening of the limb, and the foot being distorted outward. In cases of this kind, the short head of the biceps, the vasti, and the cruralis, will, however, have no force over the fracture. When the neck of the os femoris is fractured within the orbicular ligament (which remains entire,) it is clear, that the retraction must be much limited.

I might strengthen the preceding observation, that in proportion as the fracture is high, the greater is the difficulty experienced in maintaining the ends of the fracture in contact, by noticing, that I have seen several cases, in which the os femoris was broken very low indeed, and in which no retraction or displacement whatever happened. Perhaps, these fractures might have been of the transverse kind, and, perhaps the greater surface for apposition, on account of the expanded form of the bone, at this part, might have had some share in preventing retraction. But, it must appear certain, that, in such instances, several muscles would have lost almost, or entirely, their influence to produce that effect; such as the triceps, pectinalis, &c. and the muscles moving the leg, remained the only powers capable of such action.

The position of the fractured os femoris, says Mr. Pott, should be on its outside, resting on the great trochanter; the patient's whole body should be inclined to the same side; the knee should be in a middle state between perfect flexion, or extension, or half-bent; the leg and foot lying on their outside also, should

be well supported by smooth pillows, and should be rather higher in their level, than the thigh; one very broad splint of deal, hollowed out, and well covered with wool, rag, or tow, should be placed under the thigh, from above the trochanter quite below the knee; and another somewhat shorter should extend from the groin below the knee on the inside, or rather in this posture on the upper side. The bandage should be of the eighteen-tail kind, and when the bone has been set, and the thigh well placed on the pillow, it should not without necessity (which necessity in this method will seldom occur) be ever moved from it again, until the fracture is united; and this union will always be accomplished, in more or less time, in proportion as the limb shall have been more or less disturbed. (Pott.)

Here only two splints are mentioned; the surgeons of the present day always employ four. After placing the patient in a proper position, the necessary extension is to be made. Then the undersplint, having upon it a broad soft pad, and an eighteen-tailed bandage, is to be laid under the thigh, from the great trochanter to the outer condyle. The surgeon, before applying the soap plaster, laying down the tails of the bandage, and putting on the other three splints, is to take care that the fracture lies as evenly as possible.

In the position for a fractured thigh, Mr. Pott, we find, directs the leg and foot to be rather higher in their level, than the thigh; with what particular design I have not myself been able to make out. Whoever meditates upon the consequence of elevating the leg and foot above the level of the thigh, in the bent position, will know, that it is to twist the condyles of the os femoris more outward, than is natural. When a patient is placed, according to Mr. Pott's direction, upon a common bed, the middle soon sinks so much that the leg becomes situated very considerably higher than the thigh, and I am disposed to think, that this is one cause, why so many broken thighs are united in so deformed a manner, that the foot remains permanently distorted outward. The great propensity of the triceps, and other muscles to produce this effect, may also serve to explain the frequency of the deformity. It is not merely the depression of the middle of the bed which is disadvantageous, as the weight of the patient's body falls more upon one side of the bed, than the other, in the bent position of the limb, unless the sacking is tight and the mattress very firm, it happens, that such a declivity is formed, as to render it ex-

ceedingly difficult, if not impracticable, to make the patient continue duly upon his side. It cannot be enjoined too forcibly, that fractured thighs should always be laid upon beds not likely to sink much. When this happens, no rational dependence can be put in the efficacy of the bent position; and, as Desault has explained, the same thing is hurtful also in the straight posture.

From what has been delivered it may easily be discerned, that inferences from anatomical circumstances are in most fractures of the thigh chiefly in favour of the bent position; for it appears, that of all those muscles which have primary influence over the majority of such accidents, that is, over all those which occur below the insertion of the *gluteus maximus*, there is only one muscle, viz. the *rectus femoris*, that is not more, or quite as much relaxed in it, as in the straight position. Since, however, experience is the great arbitrator of all practical questions, we must still look to it for decisive information, and to form a true judgment in this way, the straight and bent positions ought to be contrasted in every hospital with due attention to all collateral circumstances; the progress and termination of every case ought to be registered; and the comparative view, thus kept up, would quickly diffuse one kind of conviction throughout the profession. The most enthusiastic advocates for the bent position must allow, that it leaves the leg and foot too moveable and unsupported, and, that though it may relax the muscles, which have the most power to disturb the coaptation of a fractured thigh, it yet leaves unrelaxed a mass of muscle quite sufficient to displace the ends of the bone. Hence, it behoves practitioners to endeavour to improve the apparatus employed, so that it may make a permanent resistance to the action of the muscles. In the straight position, such resistance may certainly be practised with most effect and convenience.

There are some very excellent remarks on the treatment of fractured thighs in *Les Œuvres Chirurgicales de Desault par Bichat*. It is observed, that, if we compare the natural powers of displacement with the artificial resistance of most of our apparatuses, we shall find, that the disproportion between such forces is too great to make the former yield to the latter. The action of the muscles, however, which is always at first very strong, may afterwards be gradually diminished by the extension exercised on them. A power incessantly operating can effect, what another greater power temporarily applied, cannot at once accomplish, and

the compression of circular bandages tends also to lessen the force of the muscles.

Desault cured in the *Hôtel-Dieu* an immense number of fractured thighs, without any kind of deformity. It was particularly to the well-combined employment of extension, and compression of the muscles, that such success was owing. The advantage of keeping the limb a long while extended, in order to diminish their power, is especially evident in the reduction of certain dislocations, as those of the shoulder, in which we often cannot succeed till the muscles have been kept on the stretch for a greater, or lesser time. The fracture of the patella and olecranon equally demonstrates the utility of compression for the same purpose; as when the muscles are not compressed by the bandage, they draw upward the fragment of bone with double, or triple force. (*Desault par Bichat*.)

Against reducing fractured thighs in the bent posture, Desault entertained the following objections: the difficulty of making the extension and counter extension, when the limb is so placed; the necessity of then applying them to the fractured bone itself, instead of a situation remote from the fracture, as, for example, the lower part of the leg; the impossibility of comparing with precision the broken thigh with the sound one, in order to judge of the regularity of its shape; the irksomeness of this position long continued, though it may at first seem most natural; the inconvenient and painful pressure of a part of the trunk on the great trochanter of the affected side; the derangement, to which the limb is exposed when the patient has a motion; the difficulty of fixing the leg firmly enough to prevent the effect of its motion on the thigh-bone; the manifest impossibility of adopting this method, when both thighs are fractured; lastly, experience in France having been little in favour of such posture.

Also, what is gained by the relaxation of some muscles, is lost by the tension of others. For such reasons, (certainly strong ones,) Desault abandoned the bent position, and always employed the straight one, which was advised by Hippocrates, and all the Greek physicians.

Petit, Heister and Duverney, recommend applying the extending means just above the condyles of the *os femoris*. Dupouy was one of the first to remark, that this practice rendered it necessary to employ very great force, and that it would be better to make the extension from the foot. Fabre takes into consideration also the inconvenience of the pres-

sure, made on the muscles, which irritating and stimulating them to action, multiplies the obstacles to setting the fracture. Desault adopted their doctrine, for nearly the same motives, introduced it at the Hôtel Dieu, and the success he experienced in consequence, did not contribute a little to its wider diffusion.— (*Desault par Bichat.*)

Desault, as we have stated, preferred the straight posture, and laid his patients on surfaces, not likely to sink with the weight of the body. The feather beds, formerly in common use at the Hôtel-Dieu had this inconvenience; for these, in cases of fractures, Desault substituted a firm, tolerably hard mattress, which did not allow the continual change of posture to occur, which a soft bed does. The object of every apparatus being to keep the ends of the fracture from being displaced, the mechanism of every contrivance, for this purpose, should be directed against the causes of the derangement. These are, 1. the action of the muscles, drawing upward the lower end of the fracture; 2. the weight of the trunk propelling downward the upper end. Hence, every apparatus, intended to prevent derangement of a thigh fractured obliquely, should, 1. draw and keep downward the lower end of the fracture; 2. carry and maintain upward the upper end of the fracture, and the trunk, which is above it. This principle is of general application, and only subject to a few exceptions in transverse fractures, attended only with derangement in the direction of the diameter of the limb, or else none at all. 3. There must also be in the apparatus a resistance to the rotation of the lower portion of the broken bone, which will keep the limb steady, even in case of any sudden motion. (*Desault par Bichat.*)

If we compare the operation of the different pieces of our apparatuses with the above indications, we shall find, that, without permanent extension, they are not very effectual. With regard to bandages, whether a roller, or eighteen-tailed bandage, be used, they all have one common mode of operating; they press the muscles towards the ends of the fracture so as to make them form a kind of natural case for the fracture, and thus they make lateral resistance against the parts. In this manner, bandages materially aid in preventing derangement side-ways, and are particularly useful in transverse fractures. But, what is there to hinder the two inclined surfaces of an oblique fracture from slipping one over the other? What power is there to keep the limb from receiving the effects of accidental

shocks? Is the pelvis kept back? Is the action of the muscles resisted? The latter is indeed somewhat diminished by the pressure, and this is the chief use of the bandage; but, will such compression be enough to prevent the longitudinal derangement of the broken bone, especially, if the bandage be applied slackly, as some advise? (*Desault par Bichat.*)

These remarks apply also to compresses; *petit moyen contre une grande cause.*

Splints are useful in firmly fixing the limb, and guarding it from the effects of accidental shocks, or of contractions of the muscles. They operate more powerfully, than bandages, in preventing lateral derangement, and, hence, they suffice for transverse fractures, without any permanent extension being employed. They can also resist the rotation of the thigh outward, or inward. But, when the breach of continuity is oblique, will they hinder the ends of the bone from gliding over each other, and the consequent shortening of the limb? They obviously could only do so, by the friction of the different pieces of the apparatus, especially, the tapes, which fasten it, and then, to make the resistance effectual, they must be tied so tightly as to create a danger of mortification. Will the splints prevent the trunk from descending, and propelling before it the upper end of the fracture? Will they paralyze the action of the muscles on the lower end? Will they, in short, fulfil all the above indications? Their use is almost limited to preventing lateral derangement, and steadying the limb. Hence, they should extend along the leg, as well as the thigh, which is disturbed by the motions of the lower part of the limb.

The pads are chiefly useful in keeping the limb from being galled by the splints, and tend only trivially to keep the fracture from being displaced.

From the above account, it appears, that the ordinary pieces of apparatus, which do not execute any permanent extension, may perhaps suffice for transverse fractures, which are not common; but, that they are always ineffectual, when the division is oblique, because, they do not fulfil the two-fold indication of drawing downward the lower end of the fracture, and keeping the other one upward. (*Desault par Bichat.*)

Desault ascertained, that the object particularly to be aimed at, was such a disposition as that the foot, leg, thigh, and pelvis, should constitute but one whole; so that, though the different parts thereof should be drawn in different directions, yet they should still, with re-

spect to one another, preserve the same mutual relation. He invented the following apparatus to answer these purposes.

A strong splint, long enough to extend from the ridge of the os ilium to a certain length beyond the sole of the foot, is a principal part of this apparatus: this splint should be two inches and a quarter broad, and have each of its extremities pierced in shape of a mortice, and terminated by a semicircular niche. It is applied on the exterior side of the thigh, by means of two strong linen bands, each being more than a yard long.

[Dr. Physick has greatly improved this splint by increasing the length of it sufficiently to extend up to the axilla; an account of this improvement is contained in the following extract from Dr. Caldwell's translation of Desault.

"Dr. Physick having observed that in the application of Desault's apparatus, the patient was sometimes injured by the pressure of the strap or roller which passes under the tuberosity of the ischium for the purpose of making counter-extension, devised the following method of remedying this inconvenience in which he succeeded to his wishes.

"He directed the upper end of the long external splint to be formed like the head of a crutch, and the splint itself to be lengthened so as to reach and bear against the axilla of the affected side, which must be well defended from pressure by a bolster of flannel or some other soft material. By this expedient the Dr. evidently formed two points, of counter-extension, instead of one, as in the case in the apparatus of Desault. Between these two points, namely, the axilla and the perineum, the same quantity and force of pressure is, by Dr. Physick's improvement, *divided*, which, in the original apparatus of Desault, is borne by the *perineum alone*. The risk of excoriation and injury to the patient, then, in the former case, is to that which he runs in the latter, only as one to two, or nearly so. As it is no less the duty of the surgeon to prevent suffering than it is to remove deformity, or to save life, Dr. Physick has certainly in this respect made an important step in the advancement of his profession.

"But there is still another advantage derived from the lengthening of the external splint. In the original apparatus of Desault, the strap intended for counter-extension, by passing no higher up than the spine of the ilium, runs too much across, and therefore acts too much on, the upper part of the thigh.

By this it not only irritates the muscles of the part, and induces them to contract, but also tends to draw the upper fragment of the os femoris a little outward, and thus to render the thigh in some measure deformed. But, in the improvement of Dr. Physick, the strap is secured in a mortice cut in the external splint, about midway between the spine of the ilium and the axilla. This strap, by being thus carried higher up on the body, does not run across the thigh at all. It consequently presses on and irritates the muscles much less, acts more in the direction of the os femoris, and has no tendency to draw the superior fragment outward."]

The middle part of one of these bands is to be applied to the inside of the thigh, at its upper part; its ends are brought to the exterior side of the thigh, passed through the mortice, and knotted on the semicircular niche. Compresses are to be previously placed under the middle part of the band, in order to prevent any disagreeable pressure; as well as on the tuberosity of the ischium, which Desault considered as the principal point of action of this band. The inferior part of the leg is, in the next place, covered with compresses, on which the middle part of the second band is placed: the extremities of this band are crossed on the instep and upper part of the foot, then on the sole, after which they are conveyed outward, and one end passed through the mortice and knotted with the other on the niche, with such a degree of force as to pull the inferior portion of the femur downward, and to push the splint upward, and, by this means, the pelvis and superior fractured portion. On the internal side of the limb is placed a second splint, which extends from the superior part of the thigh, to a certain distance beyond the foot. A third is placed on the anterior part, and extends from the abdomen to the knee. The superior extremities of the anterior and exterior splints are fixed by means of a bandage passed round the pelvis. A band, the middle part of which is placed under the sole of the foot, and the extremities crossed on its superior surface, and fastened to the splints, prevents the motion of the foot, as do also the splints.

Before applying the apparatus, the whole limb is to be covered with compresses, wet with a solution of the acetite of lead. Over these, Scultetus's bandage is to be put, and a roller round the foot, all moistened in the same manner. For more particulars, the reader is referred to the *Parisian Chirurgial Journal*, Vol. I. ou les *Œuvres Chirurgicales de De-*

sault par Bichat; *Léçons sur les Maladies des Os*; Richerand's *Nosographie Chirurgicale*, Tom. 3.

[The reader must decide for himself between the two opposite methods of treatment here recommended in fractures of the lower extremity. The method taught in the University of Pennsylvania is that of Desault improved by Dr. Physick; its success is such, as perfectly satisfies me, and I believe most of those who have properly tried it.]

Fractures of the Neck of the Thigh-bone.

This part of the bone may be fractured either by falls on the great trochanter, on the sole of the foot, or the knee. But the first incident produces the injury much more frequently, than the latter ones. Of thirty cases, which occurred to Desault, four-and-twenty arose from falls on the side. All those inserted by M. Sabatier in his interesting Memoir, were the result of a similar accident.

1. The fracture may take place in the middle of the neck, where there is less thickness, and the texture is not compact, as in the middle of the cylindrical bones, which are so much exposed to fractures.

2. Where it is united to the head of the bone.

3. Where it joins the great trochanter, in which event, the breach of continuity may be on the outside of the joint, which happens more frequently, than has been supposed.

The division is seldom oblique, almost always transverse; the neck being sometimes, in the latter case, wedged in the body of the bone, as Desault found in several instances; a model of one of which, in wax, is preserved in the collection of *L'Ecole de Santé*, and the natural specimen of which was in the possession of Bichat. The fracture of the neck of the thigh-bone is sometimes complicated with that of the trochanter major.

The diagnosis is occasionally so difficult, that the best-informed practitioners cannot always ascertain the accident with certainty. At the instant of the fall, an acute pain is felt, (sometimes a crack is distinctly heard) and a sudden inability to walk occurs; the patient cannot raise himself from the ground, which, however, is not invariably the case. In the fourth vol. of the *Mem. de l'Acad. de Chirurgie*, a case is related, in which the patient walked home after the accident, and even got up the next day. Desault published a similar example. The locking of one end of the fracture in the other,

may offer an explanation of this circumstance.

A shortening of the limb almost always takes place; but this symptom is more or less striking, according as the breach of continuity is out of the cavity of the orbicular ligament, which then keeps the bone from being retracted; or, as the extremity of the fracture is confined by this ligament. The action of the muscles drawing upward the lower end of the fracture, the weight of the trunk propelling downward the pelvis and upper end of the fracture, are the two causes of the shortening of the limb. A slight effort suffices, in general, for the removal of this shortening of the limb; but, the symptom recurs almost as soon as such effort ceases; and Goursault and Sabatier have remarked, that it sometimes does not take place at all, till a long while after the accident. A swelling is observable at the upper and front part of the thigh, always proportioned to the retraction, of which it appears to be an effect.

The projection of the great trochanter is almost entirely effaced. Directed upwards and backwards, this eminence becomes approximated to the crista of the os ilium; but, if pushed in the opposite direction, it readily yields; and, when arrived at its natural level, the patient becomes capable of moving his thigh.

The knee is a little bent. Abduction of the limb always occasions acute pain. If, while the hand is placed on the great trochanter, the limb is rotated on its axis, this bony projection may be felt revolving on itself, as on a pivot, instead of describing, as in the natural state, the segment of a circle, of which the neck of the femur is the radius. This symptom, which was particularly noticed by Desault, is very manifest when the fracture is situated at the base of the neck, less so when at its middle; and it is not very perceptible when the breach is near the head of the bone. In the rotatory motions, the lower fragment rubbing against the upper one, produces a distinct crepitus, which, however, is not an invariable symptom.

The toes are usually turned outward; a position which Sabatier, &c. consider as the inevitable effect of the fracture, though Paré and Petit have noticed, that it did not constantly occur. Two cases adduced by these illustrious surgeons, were not credited by M. Louis; but the experience of Desault has fully confirmed the possibility of the occurrence.

The position outward is commonly imputed to the rotator muscles. But, then it is clear, that such position ought always to exist; that all the muscles, which

proceed from the pelvis to the trochanter, are, with the exception of the quadratus, in a state of relaxation, by the approximation of the femur to their point of insertion; and that the contracted muscles would not allow the foot to be so easily turned inward again. It is not more probable that the weight of this part itself may pull it into the position, in which it is commonly found.

It follows from the preceding account, that none of the symptoms of a fracture of the neck of the thigh-bone are exclusively characteristic; that each considered separately, would be insufficient, and that their assemblage can alone throw light on the diagnosis. In every instance of doubt, however, the sure course must be pursued, and the apparatus applied, which, though useless, is not dangerous, should the injury not exist, and is indispensably necessary when it does. (*Desault par Bichat.*)

It was at one time supposed, that fractures of the neck of the thigh-bone could not be cured, without some shortening of the limb, and lameness, remaining afterwards. Professor Ludwig, Sabatier, and M. Louis, broached this doctrine, and imputed the circumstance to the destruction of the neck of the bone. Desault, however, rarely met with instances of such lameness in his practice,

The treatment of these cases is not at all different from that of other fractures of the body of the bone. Most surgeons in this country adhere to Mr. Pott's plan of laying the limb in a bent posture; while, in France, they prefer the straight position, with Desault's apparatus, above described.

Fracture of the Patella.

This bone is almost always broken transversely, and the accident may be occasioned either by the action of external bodies, or by that of the extensor muscles. In the latter case, the fall is only consequent to the fracture, and, as Camper has remarked, is most frequently only an effect of it. For instance, the line of gravity of the body is, by some cause or another, inclined backward; the muscles in front contract to bring it forward again; the extensors act on the patella; this breaks, and the fall ensues. A soldier broke his patella in endeavouring to kick his serjeant; the olecranon has been broken in throwing a stone. A man, at the Hôtel-Dieu, fractured both bones of his knee, in the operating theatre there, by the violent spasms of the muscles, which followed an operation for the stone. The force of the muscles occasionally rup-

tures the common tendon of the extensor muscles, or, what is more frequent, the ligament of the patella. Petit, Desault, and Sabatier, have remarked these occurrences. The patella can only be broken longitudinally by outward violence. Here it is only necessary to treat of transverse cases.

The symptoms are, a considerable separation between the two fragments of the bone, very perceptible to the finger, when the hand is placed on the knee. This separation is not occasioned equally by both portions, the upper one, embraced by the extensor muscles, is drawn upward very forcibly by these powers, which the patella no longer resists. The inferior portion, being merely connected with the ligament below, is, on the contrary, not moved by any muscle, and can only be displaced by the motions of the leg, to which it is attached. Hence the separation is least when the limb is extended, as it is then only produced by the upper fragment; greatest, when the limb is bent, because both pieces contribute to it; and it may be increased, or diminished, by bending the knee more or less.

The diagnosis is also made clearer, by the possibility of moving the two portions of bone transversely, so as to cause a crepitus and pain. The swelling of the knee, apt to follow fractures of the patella, may, when very great, obscure the other diagnostic symptoms. The difficulty of standing up, and the almost utter inability of walking, in consequence of the extensors not being able to move the leg, unless the fracture be very low down, are other symptoms.

The two grand indications, in the treatment of the fractured patella, are to overcome the action of the extensor muscles of the leg, and to keep this part immovably extended. The latter object is easily accomplished; the first requires, that the contractile force of the muscles should be first lessened, so as to diminish the effort, which they make to draw up the superior portion of the bone, and then to oppose to them a mechanical resistance, which, operating in a diametrically opposite direction, will render their efforts ineffectual.

The power of the muscles is to be diminished by relaxing their fibres, which may easily be done, by bending the thigh on the pelvis, and extending the leg, and by compressing the muscles with a roller. With regard to the mechanical resistance, which must operate directly against the contraction of the muscles, and prevent them from pulling upward the superior portion of the patella it should consist of something placed and main-

tained above it, with sufficient force to keep it from ascending.

Desault used to set a fractured patella as follows: one assistant fixes the pelvis, while another keeps the leg completely extended on the thigh, and this on the pelvis. The surgeon, standing on the side of the fractured limb, is to apply a longitudinal linen compress to the whole front of the leg and thigh, taking care to make two openings in it, corresponding with the sides of the patella. This strip of linen is to be then fixed, by two or three turns of a roller, at the ankle; its lower end then turned up, and the roller also applied over it. The circular bandage is next to be continued to just below the knee, when the surgeon is to push upward the lower portion of the patella, apply two or three turns of the roller just below it, in order to fix it; desire an assistant to hold the roller, enjoin him, who has the care of the longitudinal piece of linen, to draw it up firmly, while the integuments are pushed in the same direction, lest they should sink between the two pieces of the bone. The fingers of the left hand are then to be introduced into the openings of the linen compress, for the purpose of pushing downwards the upper part of the patella.

The two pieces being in accurate contact, the surgeon takes the roller again; carries it obliquely behind the ham, brings it up behind the upper part of the bone, withdraws his fingers, which served to keep it down, substitutes for them two or three moderately tight turns of the bandage, then covers the whole of the knee and thigh with the same. When arrived as high as the upper part of the limb, the assistant, who draws the longitudinal piece of linen forcibly upwards, is to turn down its ends over the circles of the roller, with a few turns of which it is then to be fixed. The bandage is then to be applied round the limb down to the ankle, where its application is to end.

The separation of the lower fragment is further to be prevented by extending the leg on the thigh, and the muscles relaxed by extending the latter on the pelvis. Nothing keeps the leg more surely extended, than a long, strong splint, which Desault next applied to the posterior part of the thigh and leg, and fixed there with a roller, while the thigh itself is to be bent by raising the whole limb, from the heel to the top of the thigh, with pillows, which, of course, must form a gradual ascent from the tuberosity of the ischium to the foot.

Desault used also to keep all the apparatus wet with the saturnine lotion. (*Desault par Bichat.*)

The above method certainly fulfils every indication; and the chief trouble of the surgeon is to keep the bandages from becoming too slack. In this country, practitioners overlook many little niceties of apparatus, which the French are, perhaps, too fond of, and, in the case of a fractured patella, trust to the roller, applied with tolerable tightness, just above the upper piece of the bone, and then over the knee, in the form of a figure of 8, while the limb is kept in the above position, with a splint and pillows.

The broken patella is almost always united by a ligamentous substance, instead of a bony one. Pott, and some others, thought, that there being commonly an interspace afterwards between the two pieces of the patella, with a certain length of the connecting substance might be advantageous in the motion of the joint; but Desault always noticed, that the greater the distance between the two pieces of the bone, the greater was the difficulty afterwards in walking up a rising, or over an unequal ground.

Fractures of both Bones of the Leg.

These may be transverse or oblique. The longitudinal derangement is much less common than the horizontal or angular. In the former case, the inferior pieces are almost always drawn outward and backward, whilst the superior project internally and forward. The angular derangement may be produced either by the action of the posterior muscles of the leg, or the weight of the body, and in either case the angle will be salient anteriorly. The salient angle may take place posteriorly, if the heel be too much raised. The derangement in the circumference arises from the inclination of the foot inward or outward, but it most commonly falls in the latter direction. The longitudinal derangement is extremely rare; and cannot easily take place in transverse fractures, on account of the considerable extent of the fractured surfaces; but, in oblique fractures, the inferior pieces are almost always drawn upward by the action of the posterior muscles of the leg, in which position of the parts the lower ends of the superior portions project anteriorly, and may be felt by the hand. Sometimes, however, when the solution of continuity is obliquely downward and outward, the anterior projection will be produced by the lower pieces. In some cases, the pointed ends of the bones tear and penetrate the integuments in both kinds of derangement, so as to cause a compound fracture.

The usual symptoms denoting a fracture of the leg, are, change of direction and shape of the limb, pain, and incapability of motion, mobility of the fractured pieces, and a crepitus always distinct, &c.

Fractures, which take place near the knee, are not much subject to derangement, on account of the thickness of the bone at that part; but are, however, more dangerous than those of the middle part, as being subject to be followed by a stiffness of the knee-joint. Fractures of the inferior part are still more dangerous. Oblique fractures are very difficult to be managed; and when their derangement is upward and outward, the integuments are very apt to be torn by the projecting points of the superior portions of bone. (*Boyer.*)

Fractures of the Tibia.

If the fracture take place near the ankle, the great extent of the fractured surfaces prevents any considerable derangement of the fractured portions; and the fibula acting as a support on the external side, contributes also to this effect.

This circumstance renders a diagnosis of fractures of the tibia often very difficult, and the difficulty is further increased by the little pain and inconvenience produced by such a fracture, with which persons have been known to walk.

Whenever there is reason to suspect the accident, in consequence of a blow or a fall on the leg, the part should be minutely examined. The fingers are to be moved along the anterior side of the tibia, the slightest inequality in which may be easily perceived, on account of its being covered only by the skin; and the motion of the pieces may be perceived, by grasping the opposite ends of the bone and pushing them in contrary directions. This motion, however, and the crepitus which accompanies it, are very indistinct on account of the fibula not allowing the fractured portions to be sufficiently moved on one another. (*Boyer.*)

Fractures of the Fibula.

Sometimes the foot is turned forcibly inwards or outwards, in which case, the ligaments of the articulation are always strained, and very frequently lacerated. It is in a case of this kind, when the foot is forcibly turned outwards, that the fibula is fractured by the pressure of the astragalus. We have given Pott's account of such accident in the article *Dislocation*.

To the fractures, produced by this

cause, are to be added those resulting from a fall, or a blow on the external side of the leg, in which the bone always yields in the part to which the force is immediately applied.

Whatever be the manner, in which a fracture of the fibula is produced, the pieces are not susceptible of the longitudinal derangement; but are in all cases drawn a little towards the tibia, by the muscles placed in the interspace between them. Hence a fracture of this bone will be best ascertained by pressing the fractured portions inward. This symptom, and the consequent crepitus, may be also observed in the abduction and adduction of the foot. These signs are more evident when the fracture takes place near the ankle, than when it happens high up, where the bone is covered with thick muscles. (*Boyer.*)

Treatment of Fractures of the Leg.

As in cases of fractured thighs, the practitioner may adopt either a bent or a straight position of the limb. In this country, surgeons mostly follow Mr. Pott's advice, and select the first one, of which alone I shall treat.

"In the fracture of the fibula only, the position is not of much consequence; because by the tibia remaining entire, the figure of the leg is preserved, and extension quite unnecessary; but still, even here, the laying the leg on its side, instead of on the calf, is attended with one very good consequence, viz. that the confinement of the knee, in a moderately bent position, does not render it so incapable of flexion and use afterward, as the straight or extended position of it does, and consequently, that the patient will be much sooner able to walk, whose leg has been kept in the former posture, than he whose leg has been confined in the latter.

"In the fracture of both tibia and fibula, the knee should be moderately bent, the thigh, body, and leg, being in the same position as in the broken thigh. If common splints be used, one should be placed underneath the leg, extending from above the knee to below the ankle, the foot being properly supported by pillows, bolsters, &c. and another splint of the same length should be placed on the upper side, comprehending both joints in the same manner; which disposition of splints ought always to be observed, as to their length, if the leg be laid extended in the common way, only changing the nominal position of them, as the posture of the leg is changed, and calling

what is inferior in one case, exterior in the other; and what is superior in one, in the other inferior.

"If Mr. Sharp's splints be made use of, there is in one of them a provision for the more easy support of the foot and ankle, by an excavation in, and a prolongation of the lower, or fibular splint, for the purpose of keeping the foot steady." (*Pott.*)

The strong muscles of the leg being relaxed by placing the limb in the bent position, as advised by Pott, the surgeon is to make such extension as seems requisite, for bringing the ends of the fracture into even apposition. Then he is carefully to raise the leg a little way from the surface of the bed, by taking firmly hold of the limb, above and below the fracture, and elevating the broken bones together, in such a way as shall keep both the upper and lower portions as nearly as possible on the same level. At this moment, an assistant should put, exactly beneath the leg, the under splint, which has been previously got ready, by covering it with a soft pad, and laying over this an eighteen-tailed bandage. The limb is now to be gently depressed, till it rests on the apparatus. The surgeon, before proceeding further, must once more observe that the ends of the bones are evenly in contact. Being assured of this important point, he is to apply a piece of soap plaster, and lay down the tails of the bandage. Another soft pad, well filled with tow, is next to be put over the upper surface of the leg, and over that the other splint, when the straps are to be tightened.

Fractures of the Scapula.

The acromion, inferior angle, neck, and coracoid process, are the parts most commonly fractured. When the acromion is broken, the weight of the arm, and the contraction of the deltoid muscle, draw it downward, while the trapezius and levator scapulæ draw the rest of the bone upward and backward. The serratus major anticus draws forward the lower angle, when this part is fractured, while the rest of the scapula remains in its natural situation; or, if the angular portion be considerable, the teres major, and some fibres of the latissimus dorsi, contribute to its derangement forward and upward.

The pectoralis minor, coraco-brachialis, and short head of the biceps, concur in drawing forward and downward the coracoid process, when it is broken. (*Boyer.*)

When the neck of the scapula is frac-

tured, the weight of the arm makes it drop down so considerably, as to give the appearance of a dislocation; but, the facility of lifting the os brachii upward, the crepitus, and the falling of the limb downward again, immediately it is unsupported, are circumstances clearly marking, that the case is not a dislocation. Sometimes great pains, and a crepitus, are experienced, on moving the shoulder-joint, after an accident; and yet the spine, that part of the scapula, and all the above parts, are not broken. In this circumstance, we may suspect either that a small portion of the head of the os brachii, or a little piece of the glenoid cavity of the scapula, is broken off; which latter occurrence I think is not a very uncommon one.

Fractures of the acromion are attended with pain, which is increased by the motion of the arm; the form of the shoulder is changed; the broken part, which has descended, may be raised, by bringing up the elbow close to the side. (*Boyer.*)

When the inferior angle is broken, the part remains motionless, while the rest of the scapula is moved; and it is so separated, that no mistake can be made. (*Boyer.*)

Fractures of the spine and body of the bone, are all attended with a crepitus; and, in the first cases, an irregularity in the course of the spine of the bone may generally be easily felt.

TREATMENT.

When the scapula is fractured longitudinally, or transversely, it is merely necessary to fix the arm to the side by means of a bandage, which includes the arm and trunk, from the shoulder to the elbow. Thus the motions of the shoulder, which are only concomitant with those of the arm, are prevented. (*Boyer.*)

When the inferior angle is broken, and drawn downward and forward by the serratus major anticus, the scapula must be pushed toward the fragment, by pushing the arm itself inward, downward, and forward, where it is to be kept with a roller. The fragment is also to be kept backward, as much as possible, with compresses and a roller. The arm is to be supported in a sling. (*Boyer.*)

The fractured acromion requires the arm to be so raised, that the head of the os brachii will push up the acromion, while an assistant pushes the scapula forward and downward, in a contrary direction to that of the arm. To maintain this position, a circular bandage is to be applied round the arm and body.

Desault used to apply also a small pillow under the axilla, before putting on the bandage, to make the head of the os brachii project more upward, on bringing the arm near the side. Compresses are to be placed on the scapula, which, with this means, and a roller, are to be kept downward and forward.

When the coracoid process is fractured, the muscles attached to it are to be relaxed, by bringing the arm forwards towards the breast, and confining it there in a sling; while the shoulder is kept downward and forward, and a compress confined just under the broken part, with a roller.

The treatment of a fracture of the neck of the scapula consists in raising the shoulder to its proper height; in completely taking off the weight of the arm, by wearing a proper sling, which always supports the limb from the elbow to the fingers; and in entirely preventing all motion of the arm by binding it to the trunk with a roller.

Fractures of the Clavicle.

This bone being long and slender, unsupported at its middle, and protected externally only by the integuments, is very often broken. Its serving to keep the scapula at a proper distance from the sternum, and as a *point d'appui* for the os brachii, every impulse of which it receives, makes its fractures still more common.

It may be broken at any part; but, its middle, where the curvature is greatest, is most frequently the situation of the injury. It is not very often fractured at its scapular extremity. However, a direct force, falling on the shoulder, may break any part of the clavicle, on which it immediately acts. The soft parts, in this kind of case, will also be contused, or even lacerated.

A comminuted fracture may be thus occasioned, and, if the violence be very great, the subclavian vessels and nerves may be torn. The fall of a heavy body on the shoulder often gives rise to a paralysis of the arm.

When the fracturing force is applied to the ends of the bone, as by a fall on the point of the shoulder, or on the hands, while the arms are extended, the clavicle may be very much bent, and fractured so obliquely, that the broken portions shall protrude through the skin.

Fractures of this bone are usually attended with derangement of the broken ends, except when the injury takes place at the scapular extremity, and within the ligament, tying together the clavicle and coracoid process.

The external portion of the clavicle is always that which is deranged. The internal part cannot be moved out of its natural situation, by reason of the costo-clavicular ligaments, and of its being drawn in opposite directions, by the sterno-cleido-mastoidæus, and pectoralis major, muscles. The external portion, drawn down both by the weight of the arm, and the action of the deltoid muscles, and forward and inward by the pectoralis major, is carried under the internal portion which project over it. The broken clavicle no longer keeping the shoulder at a due distance from the sternum, the arm falls forward towards the breast. The patient finds it impossible to put his hand to his forehead, because this act makes a semi-circular motion of the humerus necessary, which cannot be done while that bone has not a firm *point d'appui*. The shoulder and upper extremity may be observed to be nearer the breast than those of the opposite side. The motion of the pieces of bone on one another may be felt, as well as the projection of the end of the internal portion. When the shoulder is moved, a crepitus may also be perceived, but doing this is productive of great pain, and the diagnosis is so obvious, that it is quite unnecessary.

The ancients, and many moderns, have supposed, that in order to set a fracture of the clavicle, the shoulder must be drawn back, and fixed in that position. The patient was placed on a low stool, so that an assistant might put his knee between his shoulders, which he drew back at the same time with both hands, while the surgeon applied the bandage, which was to keep the parts in this position. But, in thus drawing the shoulders towards one another, the scapula is obviously pushed towards the sternum, and with it the external portion of the clavicle, which passes under the internal one.

The figure of 8 bandage has commonly been used for maintaining the parts in this position. While the assistant keeps back the shoulders, as above described, the surgeon is to apply one end of a roller to the arm-pit on the side affected, and then make it cross obliquely to the opposite shoulder, round which it is to pass, and from this to the other shoulder, about which it is to be rolled in the same manner, and crossed afterwards repeatedly before and behind. The tightness, with which it is necessary to apply this bandage, produces a great deal of excoriation about the arm-pits, and the effect is to make the ends of the fracture overlap each other, the very thing which it is wished to avoid. Boyer remarks, that

the iron-cross proposed by Heister, the corselet described by Brasdor in the *Mém de l'Acad. de Chir.* and the leather strap recommended by Brunninghausen, are only modifications of the figure of 8 bandage, and are not at all better.

Extension is to be made, by means of the limb, which is articulated with the fractured bone. This is done by converting the humerus into a lever, by carrying its lower end forward, inward, and upward, pushing the shoulder backward, upward, and outward, and putting a cushion in the arm-pit to serve as a fulcrum.

Desault used to put in the arm-pit a hair or flock cushion, five or six inches long, and three inches and a quarter thick at its base. Two strings are attached to the corners of the base, placed upward, which cross the back and breast, and are tied on the shoulder of the other arm. The cushion being thus placed in the arm-pit, and the fore-arm bent, Desault used to take hold of the patient's elbow, and carry it forward, upward, and inward, pressing it forcibly against the breast. By this manœuvre, the humerus carries the shoulder outward, the ends of the fracture become situated opposite each other, and all deformity is removed.

An assistant is to support the arm in this position, while the surgeon, having a single-headed roller nine yards long, is to place one end of it in the arm-pit of the opposite side, and thence apply the bandage over the upper part of the arm, and across the back to the same situation. The arm and trunk are to be covered with such circles of the roller, as far down as the elbow, drawing the bandage more tightly, the lower it descends.

Compresses, dipped in camphorated spirit, are next to be placed along the fractured bone. Desault then used to take a second roller, of the same length as the first, and put one end of it under the opposite arm-pit, whence it was carried across the breast over the compress and fracture, then down behind the shoulder and arm, and, after having passed under the elbow, upward on the breast. Desault next brought it across to the sound shoulder, under and round which he passed it, for the purpose of fixing the first turn. He then conveyed the roller across the back, brought it over the compresses, carried it down in front of the shoulder and arm, under the elbow, and obliquely behind the back to the arm-pit, where the application began. The same plan is repeated, until all the roller is spent. The apparatus is to be secured by pins, wherever they promise

to be useful, and the patient's hand is to be kept in a sling.

Boyer has invented an apparatus for fractured clavicles, which is more simple, than that employed by Desault.

The cushion is to be applied under the arm. The apparatus consists of a girdle of linen cloth, which passes round the trunk on a level with the elbow. It is fixed on by means of three straps, and as many buckles. At an equal distance from its extremities are placed externally on each side two buckles, two before and two behind the arm. On the lower part of the arm, is to be laced a piece of quilted cloth, five or six fingers broad. Four straps are attached to it, which correspond to the buckles on the outside of the girdle, and serve both to keep the arm close to the trunk, and from moving either backward or forward. (See *Boyer's Lectures upon the Diseases of the Bones.*)

Certainly, the methods recommended by Desault and Boyer are very judicious and scientific. They are not, however, much adopted in this country, perhaps in consequence of the universal aversion among English surgeons to all apparatuses, which are not exceedingly simple. It is to be hoped, at the same time, that, in the treatment of fractured clavicles, they will always attend to the principles, which Desault and Boyer have inculcated. If they understand, why the position of the arm should be such as these eminent surgeons point out, they will have no difficulty in doing what is proper, and with a cushion sling, and a couple of rollers, they will easily maintain the proper posture.

I cannot quit this subject without cautioning the surgeon never to fall into the error of supposing the rising end of a broken clavicle to be the end which is displaced. This is the one, which is truly in its right situation, and which has often been made, by injudicious pressure, to protrude through the integuments, as I myself have seen.

FRACTURES OF THE OS BRACHII, OR HUMERUS.

This bone may be fractured at any point of its length; in the middle, at either extremity, or above the insertion of the pectoralis major, latissimus dorsi, and teres major. This last case is termed fracture of the neck of the humerus; but that denomination has not the merit of being strictly anatomical. It is possible, however, that what is strictly called the neck of the humerus may be fractured, particularly, by a gun-shot wound. By

neck of the humerus, we understand that circular narrowing, which separates the tuberosities from the head.

The fractures of this bone may be transverse or oblique, simple or compound. In short, whatever has been said of the differences of fractures in general, is applicable to those in particular. The same may be said of the causes, whether acting on the extremities of the bone, or immediately on the part fractured.

The transverse fractures of the middle part, under the insertion of the deltoid muscle, are attended with but a trifling derangement. The brachialis internus and the triceps, attached posteriorly and anteriorly to both fractured portions, counteract one another, and admit only a slight angular derangement. When the fracture takes place above the insertion of the deltoid muscle, the inferior portion is first drawn outward and then upward on the external side of the superior. Fractures of the humerus, near its lower end, such particularly as are transverse, are not subject to such derangement: an effect which is to be attributed to the breadth of the fractured surfaces; to their being covered posteriorly by the triceps muscle, and, anteriorly, by the brachialis internus, which admit only a slight angular derangement by the inferior portion being drawn a little forward.

Oblique fractures are always attended with derangement, whatever be the part fractured. The inferior portion being drawn upward by the action of the deltoïdes, biceps, coraco-brachialis, and long portion of the triceps, glides easily on the superior, and passes above its lower extremity. Finally, fractures of the neck of the humerus are always attended with derangement, which is produced by the action of the pectoralis major, latissimus dorsi, and teres major, which being attached to the lower portion near its superior extremity, draw it first inward and then upward, in which last direction it is powerfully urged by the biceps, coraco-brachialis, and long portion of the triceps. The superior portion itself is, in this case, directed a little outward by the action of the infraspinatus, supraspinatus, and teres minor, which make the head of the humerus perform a rotatory motion in the glenoid cavity.

We proceed to examine the different marks, by which these fractures may be ascertained.

The shortening and change in the direction of the limb, the crepitus, which may be very distinctly perceived by moving the broken pieces in opposite directions, the pain, and impossibility of moving the arm, &c. joined to the history of

the preceding circumstances, render it easy to establish a diagnosis.

Fractures of the neck of the humerus are not so easily ascertained, and have been frequently, for want of attention, confounded with luxations of that bone. The diagnostic symptoms of these two affections are however very different.

When the neck of the humerus is fractured, a depression is observed at the superior extremity and external side of the arm, which is very different from that accompanying the luxation downward and inward of that bone. In the latter case, under the projection of the acromion, a deep depression is found in the part which the head of the humerus naturally occupies; whereas, in the fracture of the neck of that bone, the shoulder retains its natural form, the acromion does not project, and the depression is found below the point of the shoulder. Besides, in examining the arm-pit, instead of finding there a round tumour formed by the head of the humerus, the fractured and unequal extremity of that bone will be easily distinguished. The motion of the broken portions, and the crepitus, which may be produced by moving them, serve still further to establish the diagnosis. (*Bayer on the Bones, Vol 1.*)

A simple fracture of the body of the humerus is not very dangerous; but, in that near the ends of the bone, there is some reason to expect the neighbouring joint to inflame, and remain stiff for some time after the cure.

In ordinary fractures of the os brachii, it is usual to apply two pieces of soap-plaster, which together surround the limb, at the situation where the accident has happened. Extension, if necessary, being now made by an assistant, who at once draws the lower portion of the bone downward and bends the elbow, the surgeon is to apply a roller round the limb. The external splint is to extend from the acromion to the outer condyle, and, being lined with a soft pad, the wood cannot hurt the limb by pressure. The internal splint is to reach from the margin of the axilla to a little below the inner condyle, and is to be well guarded with a pad, filled with tow, or any other soft materials.

Some surgeons are content with the application of two splints; but, though the two, above described, are those on which we are to place the greatest reliance, yet, as the cylindrical form of the arm conveniently allows us completely to incase this part of the limb in splints, I shall always be an advocate for the employment of four; one on the outside, one on the inside, one on the front, and another on the back of

the arm. These are to be carefully fixed in their respective situations by means of tape.

The elbow and whole of the fore-arm are to be quietly and effectually supported in a sling, throughout the whole treatment of the case.

FRACTURE OF THE HEAD, OR NECK OF THE OS BRACHII.

1. General Considerations.

Chirurgical language here differs from that adopted by anatomists, and, under the name of fracture of the neck of the humerus, is not meant, that of the circular, hardly perceptible depression, which separates the head from the tuberosities of this bone. By this expression, surgeons imply the fracture of that contracted part of the humerus, which is bounded above by these tuberosities, which below is continuous with the body of the bone; which has the tendons of the pectoralis major, latissimus dorsi, and teres major inserted below it; and which many practitioners extend even as low as the insertion of the deltoid muscle.

Indisputable facts, however, prove the possibility of the anatomical neck of the bone being fractured, and C. Larbaud shewed Bichat the humerus of a young man, aged 17, the head of which bone was accurately detached from its body, by a division which had obliquely interested the upper part of the tuberosities. But there are too few instances of this kind, in the records of surgery, to admit of our taking a general view of this sort of fracture.

2. Varieties and Causes.

The operation of external bodies, active, when driven against the shoulder, passive, when the shoulder or arm is driven against them, is the constant cause of the fracture of the neck of the humerus. The solution of continuity, thus occasioned, is sometimes direct, and at other times, the result of a *contre-coup*.

The first almost always arises from a fall on the fleshy part of the shoulder, and, as the motion must be exceedingly violent to produce this effect through the thick covering formed by the deltoid, this muscle is sometimes contused and affected with ecchymosis. Even blood may be effused from some of the ruptured articular veins, or arteries, and form a collection, which Desault has remarked should be speedily opened.*

The counter-fracture arises from a fall on the elbow, when this part is separated from the trunk, or else from a fall on the hand, which a natural instinct makes us extend, with the arm and fore-arm, to protect ourselves at the time of falling.

3. Symptoms, &c.

The whole of the symptoms of a fracture of the neck of the humerus sufficiently denote its existence; but, it is not always an easy matter to see this whole, and here more difficulties occur in the diagnosis, than in any other fracture of the humerus.

There is an acute pain experienced at the moment of the fall; sometimes, the noise of something breaking is heard. There is always a sudden inability to move the limb, which, left to itself, remains motionless. But, on external force being applied to the member, this readily yields, and admits of being moved, with the greatest ease, in every direction.

An acute pain attends such motion, which, carried too far, may cause bad consequences, as has been observed in patients in whom the fracture has been mistaken for a dislocation.

Below the acromion a depression is remarkable, always situated lower down, than that which attends the latter accident. If we place one hand on the head, while the lower part of the bone is moved in various directions with the other hand; or if, while extension is made, an assistant communicates to the bone a rotatory motion, the following circumstances are perceived. 1. We discover, that the head of the humerus remains motionless. 2. A more or less distinct crepitus, arising from the two ends of the fracture rubbing against each other. These two symptoms are invariably characteristic of the accident; but the swelling of the joint sometimes prevents us from detecting them.

The ends of the fracture are sometimes not at all deranged, and, as then most of the symptoms are absent, the diagnosis is rendered still more difficult. In general, however, the ends of the fracture are displaced, and, in this circumstance, it is the lower one which is out of its proper position, and not the upper one, which is of little extent, and is not acted upon by many muscles.

The displaced state of the fracture is

practice, however; both because I have observed that large extravasations of blood about the shoulder are usually very soon absorbed, and making an opening may do harm, and cannot do good.

* I must enter my protest against such

generally, not very perceptible, in regard to length, unless the fracture be very oblique, and its pointed spiculæ irritate the muscles, and make them contract with increased power; or unless the blow, which is very violent, continue to operate after the bone has been broken, and force the ends of the fracture from their state of apposition. In this way, the body of the bone has been known to have been drawn or driven upward, so as to protrude through the deltoid muscle, and integuments far above the height of the head of the bone.

But commonly, as Petit observes, the weight of the limb powerfully resists the action of the muscles, and the derangement of the fracture is more liable to be transverse. In this circumstance the lower end of the fracture is displaced outward or inward, and very rarely in any other direction. In the case, which is much the most frequent, the elbow is separated from the trunk, and cannot be brought near it without pain; in the instance of the bone being displaced outward, the limb has a tendency to the opposite direction.

4. Prognosis.

A fracture of the neck of the humerus is not a serious event, and if, as Heister remarks, *prope caput fractura pejor, et difficilius curatur*, it is less on account of the nature and situation of the disease, than of the difficulty experienced in maintaining the ends of the fracture in contact.

5. Reduction

This object usually presents but few difficulties, and the multiplicity of means formerly employed for its accomplishment, serve only to exhibit the uselessness of such resources.

Most of the machines, designed for reducing dislocations of the humerus, have been applied to this kind of fracture. To such machines succeeded the use of pulleys, weights suspended to the limb, &c. useless plans, as their only tendency was to increase the natural power, which was always more than sufficient.

Petit proposes to reduce the fracture, by first placing the arm at a right angle with the body; and then making extension with the hands of an assistant, applied above the elbow; while the counter-extension is made by another assistant, who is to take hold of the fleshy part of the shoulder. This method is liable to three kinds of inconveniences. It fatigues and even pains the patient; it lessens the extending powers by bringing them near

the moveable point, it irritates such muscles as proceed from above to the lower end of the fracture, and thus increases their disposition to contract. Hence difficulties sometimes attended the reduction, which is always simple, when, the trunk being fixed, gentle extension is made on the fore-arm half bent. Desault used to accomplish the reduction in the following way.

The patient may either sit upon a chair, or the edge of a bed. The arm is to be a little separated from the trunk, and carried somewhat forward.

An assistant is to fix the trunk by drawing towards him the arm of the opposite side. This mode of making extension is preferable to that commonly employed, and which is effected by applying the hands to the upper part of the affected shoulder. The other being more distant from the resistance, there is no need for exerting so much power; and the patient's body being quite uncovered, the surgeon can conveniently apply the bandage, without deranging the extension.

A second assistant extends the forearm half bent, which he makes use of as a lever, placing one hand behind the wrist for the purpose of a fulcrum. The other hand, applied to the front and middle part of the fore-arm, and making pressure upon it from above downward, represents the power. The ends of the fracture, which are to be placed in apposition, form the resistance.

The relaxation of muscles, produced by the half flexion of the fore-arm, and the position of the arm a little raised from the side, are peculiarly favourable to this mode of extension, recommended by the ancients and English. This method has also the advantage of leaving uncovered every part of the limb, to which the apparatus is to be applied, and thus the assistant's hands can remain in the same position during all the time of applying whatever may be needed.

In this way the reduction takes place of itself, on employing a very little force, methodically directed, according as the fracture is displaced inward or outward. If the surgeon put his hands on the situation of the fracture, it is rather to examine the state of the ends of the broken bone than to accomplish a thing seldom required, namely, what is implied by the term coaptation.

MEANS OF MAINTAINING THE REDUCTION.

All the apparatus for a fracture being only resistances, opposed by art to the powers causing the derangement of the

broken part, it follows, that the whole should act in an inverse ratio to such powers. We have seen, that these consisted : 1. Of the action of external bodies, favoured by the extreme mobility of the arm and shoulder ; 2. Of the action of the *latissimus dorsi*, *pectoralis major*, and *teres major*, which draw inward the lower end of the fracture, or, what is more common, of the deltoid, which pulls it outward ; 3. Of the contractions of the muscles of the arm, which tend to draw a little upward the said end of the fracture.

Hence, 1. to render the arm and shoulder immoveable ; 2. to bring either outward, or inward, the lower end of the fracture ; 3. to draw downward the same ; are the three indications, which every bandage, destined for a fracture of the neck of the humerus ought to fulfil. The last object merits less attention, than the two others, because the weight of the arm is alone almost sufficient for the purpose. Desault used to employ the following apparatus for the cure of fractures of the neck of the humerus.

1. Two bandages, one about five or six ells long, the other eight or ten ; both being about three finger-breadths wide.
2. Three strong splints of different lengths, and two finger-breadths broad.
3. A linen pillow, three or four inches thick at one of its ends, terminating at the other in a narrow point, and long enough to reach from the axilla to the elbow.
4. A sling to support the fore-arm.
5. A towel to cover the whole of the apparatus.

The reduction is to be effected as above explained, and the assistants are to continue the extension. Then the surgeon is to take the first roller, which is to be wet with the *aq. veg. min.* and is to fix one of its heads by applying two circular turns to the upper part of the fore-arm. The bandage is now to be rolled moderately tight round the arm upward, making each turn overlap two thirds of that which is immediately below it. When the roller has reached the upper part of the limb, it must be doubled back a few times to prevent the folds, which the inequality of the part would create. The bandage is afterwards to be carried twice under the opposite axilla, and the rest of it, rolled up, is to be brought up to the top of the shoulder, and committed to the care of an assistant.

The first splint is to be placed in front, reaching from the bend of the arm as high as the *acromion*. The second, on the outside from the external condyle to the same height. The third, behind, from the *olecranon* to the margin of the axilla. The pillow, interposed between the arm

and thorax, serves as a fourth splint, which becomes useless. An assistant applies these parts of the apparatus, and holds them on by applying his hands near the bend of the arm, in order not to obstruct the application of the remainder of the bandage.

The surgeon takes hold of the bandage again, and applies it over the splints with moderate tightness, and the bandage ends at the upper part of the fore-arm, where it began.

The assistants continually keeping up the extension, the surgeon is to place the pillow between the arm and trunk, taking care to put the thick end upward, if the fracture be displaced inward ; but downward, if this should be displaced outward, which is most common. It is to be attached by two pins to the upper part of the roller.

The arm is to be brought near the trunk, and fixed upon the pillow, by means of the second roller, applied round the arm and thorax. The turns of this bandage should be very tight below, and rather slack above, if the fracture should be displaced inward ; but, if outward, they should be slack below, and tight above.

The fore-arm is to be supported in a sling, and the whole of the apparatus is to be enveloped in a napkin, which will prevent any friction from deranging the bandages.

If we compare the effect of the above apparatus, in fulfilling the indications above specified, we shall easily see, that they are very well accomplished. The arm, firmly fixed against the trunk, can only move with it, and then nothing displaces the lower end of the fracture, which is equally motionless. The shoulder cannot communicate any motion to the upper end of the fracture. The pillow, differently disposed, according to the direction in which the lower extremity of the fracture is displaced, serves to keep this part in the opposite position.

Should this part of the bone project inward, the thick end of the pillow will remove it further from the chest. The bone will be kept at this distance from the side by the turns of the bandage, which, being very tight downward, will act upon the limb as a lever, the fulcrum for which will be the pillow, and the resistance, the action of the *pectoralis major*, *latissimus dorsi*, and *teres major*. Thus the bandage will have the effect of bringing the elbow nearer the trunk, and move the lower end of the fracture in the opposite direction, so that it may be here considered as an artificial muscle, directly opposing the natural ones.

When the lower end of the fracture is drawn outward, which is most commonly the case, the contrary effect will be produced, both from the pressure exercised by the bandage on the upper end of the displaced portion of the bone, and from the situation of the elbow, which is kept outward by the thick part of the pillow. The outer splint will also prevent the lower end of the fracture from being displaced outward, both by its mechanical resistance to the bone, and by compressing the deltoid muscle, which is the chief cause of the derangement in this direction. All derangement of the lower end of the fracture, forward, or backward, is prevented by the front and back splints.

All derangement, in regard to length, already prevented by the weight of the limb, is still more effectually hindered by the compression exercised on the muscles of the arm, causing such derangement both by the splints and roller. (See *Œuvres Chirurgicales de Desault, par Bichat, Tom. 1.*)

FRACTURES OF THE LOWER END OF THE OS BRACHII, WITH SEPARATION OF THE CONDYLES.

Fractures of the os brachii, with detachment of its condyles, seem to have escaped the notice of most authors, who have written on the diseases of the bones. The ancients have transmitted to us nothing upon the subject. Heister only mentions the fracture of the lower end of this bone, with a view of making an unfavourable prognosis. This accident is not uncommon, and Desault, in particular, had frequent occasion to meet with it.

Whatever the causes of this kind of fractures may be, they are commonly produced in such a way, that a longitudinal division separates the two condyles from each other, and extending more or less upward, is bounded by another transverse, or oblique division, which occupies the whole thickness of the bone. Hence, there are three different pieces of bone, and two fractures.

Sometimes, the division is more simple. Then, taking a direction outward, or inward, it crosses obliquely downward the lower end of the os brachii, terminates in the joint, and only detaches one of the condyles from the body of the bone. The other remains continuous with it.

In the first case, the deformity is greater, and the fractured part is more moveable. When pressure is made, either before, or behind, on the track of the longitudinal fracture, the two condyles becoming further separated from each other,

leave a fissure between them, and the fractured part is widened. The fore-arm is almost always in a state of pronation. On taking hold of the condyles, and moving them in different directions, a very distinct crepitus is perceived.

In the second case, the separation of the condyles from each other is not so easy; but a crepitus can always be distinguished, on moving the detached condyle. In one case, in which the external condyle was the only one broken, Desault found the limb always supine; a position, in effecting which, the muscles inserted into this part are, doubtless, concerned.

An acute pain, the almost inevitable effect of bending, or extending, the fore-arm; the habitual half bent state of this part of the limb, and sometimes a subsequent swelling of it, together with more or less tumefaction around the joint, are observable in both kinds of cases. These accidents may also be complicated with wounds, splinters of bone, &c. when the blow has been very violent, or a pointed piece of the bone protrudes through the flesh.

PROGNOSIS.

Almost all writers consider the communication of a fracture with a joint, as a fatal kind of complication. Swelling and inflammation of the adjacent parts; continuance of pain after the reduction; large abscesses; even mortification of the soft parts, and caries of the bones, are, according to such authors, the almost inevitable consequences of these fractures, and ankylosis the most favourable termination. Paré, Petit, Heister, Duverney, all give this exaggerated picture of these accidents.

Analogous fractures of the olecranon and patella shew, that this representation is magnified beyond truth. Modern observation has dispelled the ancient doctrine of the effusion of callus in the joint, and with it one of the principal causes, assigned by authors for the symptoms they so much dread.

The communication of the cavity of the joint with the external air might be thought to have more real influence; but, this can only occur in compound fractures. Desault has often learned from experience, that the contact of air is not so dangerous, as has been supposed.

The defect in the mode of treatment was, formerly, the general cause of all the ill consequences. Desault has never seen them in his extensive practice.

REDUCTION, AND MANNER OF MAINTAINING IT.

The detached condyles, being drawn in opposite directions by the muscles of the arm and fore-arm, commonly remain unmoved between these two powers, and are but little displaced. External force may, however, put them out of their proper situation, and they may then become displaced forward, or backward, or they may separate from each other sideways, leaving an interspace between them. The apparatus, should, therefore, resist them in these four directions, and this object is easily accomplished by means of four splints, kept on by a roller. The two lateral splints are, in particular, necessary, when the condyles are separated from the body of the bone, with an interspace between them. If one of them be still continuous with the humerus, the splint on this side will be of less use.

There is no occasion for the apparatus to extend as high as when the arm is fractured higher up. Of what avail, in steadying the fractured part, are the circles of the bandage, applied to the body of the bone, so much above the injury? Their only utility would consist in restraining the action of the brachialis and triceps, by compressing these muscles.

On the other hand, the roller should be continued over the fore-arm, in order that the joint according to the judicious precepts of Paulus Ægineta, may correspond to the middle of the bandage, which is here firmer, than any where else. This method is also of use by producing a gentle compression on the muscles implanted into the condyles.

Desault recommends having the front and back splints flexible of their middle part, which should be applied to the bend of the arm, and elbow. (*Œuvres Chirurgicales de Desault, par Bichat, Tom 1.*)

The detail of the reduction of the fracture, and application of the roller and splint, becomes useless after what has been said. A further account may be found in the work mentioned in the preceding paragraph.

FRACTURE OF THE FORE-ARM.

The fore-arm is much more frequently broken, than the arm, because external force operates more directly upon it, than the latter part, especially, in falls, on the hands, which are frequent accidents.—Bichat mentions, in his account of Desault's practice, that fractures of the fore-arm often hold the first place in the comparative table of such cases, kept at the Hôtel-Dieu.

We know, that the fore-arm is composed of two bones, the ulna and radius. The last is much more liable to fractures, than the first one, because it is articulated with the hand by a large surface. All the shocks, received by the latter part, are communicated to the radius. The situation of this bone more immediately exposes it to such causes, as may break it; a circumstance, which we may readily convince ourselves of on the first inspection. Both bones of the fore-arm may be broken at the same time, or one alone may be fractured. One fracture has been absurdly termed complete; the other, incomplete.

FRACTURES OF BOTH BONES.

These may occur at the extremities, or middle of the fore-arm. They are frequent at the middle; very common below; but, seldom happen at the upper part of the fore-arm, where the numerous muscles, and the considerable thickness of the ulna, resist causes, which would otherwise occasion the accident. The bones are usually broken in the same line; but, sometimes, in two different directions. The fracture is almost always single; but, in some instances, it is double, and Desault, in particular, was one day called to a patient, over whose fore-arm the wheels of a cart had passed, so as to break the bones, at their middle and lower part, into six distinct portions. The middle ones, notwithstanding they were quite detached, united very well, with hardly any deformity.

These accidents are most commonly occasioned by direct external violence; but, occasionally, they are produced by a counter-stroke, which is generally the case, when the patient has fallen on his hand. But, in this instance, as the hand is principally connected with the lower broad articular surface of the radius, this bone alone has to sustain almost the whole shock of the blow, and hence is usually the only one broken.

SYMPTOMS.

It is, in general, difficult to be deceived by the symptoms, indicating fractures of the fore-arm. Motion at a part of the limb, where it was previously inflexible; a crepitus, almost always easily felt; sometimes a distinct depression in the situation of the fracture; a projection of the ends of the fracture beneath the skin, but, a less common symptom; pain produced by moving the part; a noise sometimes audible to the patient at the moment of the accident; an inability to perform the

motion of pronation and supination; and an almost constant half-bent state of the fore-arm; are the symptoms, which, with the phenomena, common to all other fractures, characterize this one. These are sufficient to dispel all doubts, which immense swelling of the limb may create.

There is one case, however, in which, the fracture being very near the wrist-joint, similar appearances to those of a dislocation of this part may arise. But, attention to whether the styloid processes, are above, or below, the deformity, will discover whether the case be a fracture, or dislocation. In a fracture the part is also more moveable, and there is a crepitus. (*Euvres Chirurgicales de Desault, par Bichat, Tom. 1.*) As Boyer remarks, the two cases may be distinguished by simply moving the hand, by which motion, if there be a luxation without fracture, the styloid processes of the radius and ulna will not change their situation; but, if a fracture do exist, these processes will follow the motion of the hand. (*Boyer, Leçons sur les Maladies des Os, Tom. 1.*)

The connexion of the two bones of the fore-arm, by the interosseous ligament, which occupies the interspace by which they are separated, and the manner, in which the muscles that are attached to both, are inserted into them, render the derangement of the broken pieces in the longitudinal direction very difficult; and, in reality, a derangement in this direction has been seldom observed, and never to any considerable degree: when it does take place, it is to be ascribed to the cause of the fracture, rather than to muscular contraction. The derangement in the direction of the diameter, on the contrary, always takes place in such a manner, as that the four pieces approach one another, and the interosseous interspace diminishes, or is entirely obliterated at that part near the seat of the fracture; which approximation at the ends of the bones causes an evident deformity of the part.

To this must be added the angular deformity, which the fracturing cause always produces, either forward or backward, according to its direction.

Boyer gives the following account of the treatment of a fracture of the fore-arm, both bones being broken.

In order to adjust a fracture of these bones, the fore-arm is to be bent to a right angle with the arm, and the hand placed in a position between pronation and supination. The fore-arm and hand being thus placed, an assistant takes hold of the four fingers of the patient, and extends the fractured parts, while another assistant makes counter-extension by fix-

ing the humerus with both his hands. By these means, the operator is enabled to restore the bones to their natural situation, and to push the soft parts into the interosseous space, by a gentle and graduated pressure on the anterior and posterior sides of the arm. Coaptation is very easy in fractures of these bones, as are indeed all the other parts of the operation, in which effort and violence are not at all required.

The fracture being thus set, the bones are kept in their place by applying first on the anterior and posterior sides of the fore-arm two longitudinal and graduated compresses, the base of which is to be in contact with the arm. The depth of these compresses should be proportioned to the thickness of the arm, increasing as the diameter of the arm diminishes. In the next place, the surgeon takes a bandage about six yards long rolled up in one, and makes three turns of it on the fractured part, descends then to the hand by circles partially placed over one another, and envelopes the hand by passing the bandage between the thumb and index: the bandage is then carried upward in the same manner, and reflected wherever the inequality of the arm may render it necessary. The compresses and bandage being thus far applied, the surgeon lays on two splints, one anteriorly, the other posteriorly, and passes the part of the bandage that yet remains over them, in such a manner as entirely to cover them. It may not be unnecessary to remark, that the compresses and splints should be of the same length as the arm. It would be useless to employ lateral splints in this case, unless (what is scarcely ever to be expected or met with) a derangement should have taken place in that direction. It is evident, that lateral splints would counteract the compresses and two other splints, by increasing the radio-cubital diameter of the arm, and by concurring with the action of the pronators to move the pieces into the interosseous space. The surgeon's attention should be most particularly directed to preserve the interosseous space; for, if this be obliterated, the radius cannot rotate on the cubitus, nor the motion of pronation or supination be executed; and this object may be obtained with certainty by applying the compresses and splints in such a manner as that the fleshy parts may be forced into, and confined in, the interosseous space, and by renewing the bandage every seven or eight days.

If the fracture be simple, and the contusion inconsiderable, the patient need not be confined to bed; he may be allowed to walk about with his arm in a sling.

(*Boyer, Leçons sur les Maladies des Os, Tom. 1.*)

OF FRACTURES OF THE RADIUS.

Of all fractures of the fore-arm, this is the most frequent. The radius being almost the sole support of the hand, and placed in the same line with the humerus, is for both these reasons more exposed to fractures, than the ulna.

Fractures of the radius, whether transverse or oblique, near its middle part or extremities, may be caused by a fall or blow on the fore-arm, or, as happens in most cases, by a fall on the palm of the hand. When likely to fall, we extend our arms, and let the hands come first to the ground; in which case, the radius, pressed between the hand on the ground, and the humerus, from which it receives the whole momentum of the body, is bent, and, if the fall be sufficiently violent, broken more or less near its middle part. When, after an accident of this kind, pain and a difficulty of performing the motions of pronation and supination supervene, the probability of a fracture of the radius is very strong. The truth is fully ascertained by pressing with the fingers along the external side of the fore-arm. Also, in endeavouring to perform supination or pronation of the hand, a crepitus and a motion of the broken portions will be perceived, if the bone be in reality fractured. When the fracture takes place near the head of the radius, the diagnosis is more difficult on account of the depth of soft parts over the bone in that part. In this case, the thumb is to be placed under the external condyle of the os humeri, and on the superior extremity of the radius, and at the same time the hand is to be brought into the prone and supine positions. If in these trials, always painful, the head of the bone rests motionless, there can be no doubt of its being fractured. The causes of derangement are here the same as in fractures of the fore-arm, and it can never take place, except in the direction of the diameter of the bone, and is effected principally by the action of the pronating muscles. The ulna serves as a splint in fractures of the radius; and the more effectually so, as these two bones are connected with one another throughout their whole length. Notwithstanding the evident mechanism, which prevents the longitudinal derangement, J. L. Petit has thought that derangement possible. (*Boyer, Tom. 1.*)

When only the radius is fractured, no extension is ordinarily requisite. During the treatment the elbow is to be bent, and the hand put in the mid state, between

pronation and supination; that is to say, the palm of the hand is to face the patient's breast. Having reduced the ends of the fracture, when they appear to be displaced, the soap plaster is to be applied, and over this a slack roller. This bandage is, indeed, of no utility; but, it makes the limb seem to the unknowing by-standers more comfortable, than if it were omitted, and, as it does no harm, the surgeon may honestly apply it. However, no one can doubt, that tight bandages may act very perniciously in fractures of the fore-arm, by pressing the radius and ulna together, causing them to grow to each other, or, at all events, making the fracture unite in an exceedingly uneven manner. Only two splints are necessary; one is to be placed along the inside, the other along the outside of the fore-arm. Soft pads must always be placed between the skin and the splints, in order to obviate the pressure of the hard materials, of which the latter are formed. The inner splint should extend to about the last joint of the fingers; but not completely to the end of the nails; for, many patients, after having had their fingers kept for several weeks, in a state of perfect extension, have been a very long time in becoming able to bend them again.

Sometimes, it may be proper to apply a compress just under the ends of the fracture to prevent their being depressed towards the ulna too much, the consequence of which has occasionally been the loss of the prone and supine motions of the hand.

In setting a fractured radius, the hand should be inclined to the ulnar side of the fore-arm.

OF FRACTURES OF THE ULNA.

Fractures of this bone, less frequent than those of the radius, take place generally at its lower extremity, because it is smaller and less covered at that part, than at any other. A fracture of this bone is almost always the result of a force acting immediately on the part fractured; as, for instance, when one falls and strikes the internal side of the fore-arm against a hard resisting body. On applying the hand judiciously on the inside of the fore-arm, this fracture is easily ascertained by the depression in that part, in consequence of the inferior portion being drawn toward the radius by the action of the pronator radii quadratus. This derangement is in general less, than that which takes place in fractures of the radius. The superior portion of the cubitus remains unmoved, as has been well observed by J. L. Petit.

In this case, the assistant who makes

whatever little extension may be necessary, should incline the hand to the radial side of the fore-arm, while the surgeon pushes the flesh between the two bones, and applies the apparatus, as in the preceding case. In all fractures of the bones of the fore-arm, and, particularly, in those which are near the head of the radius, a false anchylosis is to be apprehended, and should be guarded against by moving the elbow gently and frequently, when the consolidation is advanced to a certain degree. (*See Boyer, Leçons sur les Maladies de Os, Tom. 1.*)

Fractures of the fore-arm always require this part to be kept quietly in a sling.

FRACTURES OF THE OLECRANON.

The ancients seem to have been little acquainted with fractures of the olecranon, on which subject they have been quite silent, unless Paulus Ægineta alludes to it in the following passage: *Cubitus frangitur. . . circa partem ad cubiti gibbum*. Even most of the moderns, Petit, Duverney, Bell, &c. have not given a satisfactory account of such cases. The olecranon may be fractured either at its base, or its extremity; but, the first occurrence is the most frequent. The division is almost always transverse, though occasionally oblique. The causes, producing the accident, are, either the action of the muscles, which is a very uncommon one, or external violence, which is much more usual.

With regard to symptoms, the contraction of the triceps, being no longer resisted by being connected with the ulna, draws upward the short fragment, to which it adheres, so as to produce, between it and the lower one, a more, or less evident interspace. This interspace is found situated at the back part of the joint, and it may be increased or diminished at will, by augmenting the flexion of the fore-arm, and putting the triceps into action, or else extending the limb. Another symptom, is the impossibility of spontaneously extending the fore-arm, the necessary effect of the detachment of the triceps from the ulna. The fore-arm is constantly half-bent, the biceps, and brachialis having no antagonists. The olecranon is, more or less conspicuously, drawn up higher, than the condyles of the os brachii, which latter parts, on the contrary, are naturally situated higher, than the olecranon, when the fore-arm is half-bent. The upper piece of bone may be moved in every direction, without the ulna participating in the motion. Besides these symptoms, we must take into the account, the considerable pain experienced, the crack some-

times distinctly heard by the patient, and the crepitus frequently perceptible.

The indications are to push downward the retracted portion of the olecranon, and to keep it in this position, at the same time, that the ulna is made to meet it, as it were, by extending the fore-arm. Desault says, however, it should not be completely extended, as when the pieces of bone touch at their back part, they leave a vacancy in front, which is apt to be followed by an irregular callus, prejudicial to the future free motion of the elbow. Hence, this celebrated practitioner used to put the arm between the half-bent state and extension. This posture, however, would soon be changed, if permanent means were not taken to maintain it. Desault, with this view, was in the habit of applying a splint along the fore-part of the arm. But, position evidently only operates on the lower part of the olecranon, by approximating it to the upper one. The latter requires also to be brought near the former, and fixed there, which is, doubtless, the most difficult object to effect, because the triceps is continually resisting.

Desault used to adopt the following method: the fore-arm being held in the above position, the surgeon is to begin applying a roller round the wrist, and to continue it as high as the elbow. The skin, covering this part, being wrinkled in consequence of the extension of the limb, might insinuate itself between the ends of the fracture, and consequently it must now be pulled upward by an assistant. The surgeon is then to push the olecranon towards the ulna, and confine it in this situation with a turn of the roller, with which the joint is then to be covered, by applying it in the form of a figure of S.

A strong splint, a little bent, just before the elbow, is next to be laid along the arm and fore-arm, and fixed by means of a roller. The apparatus being applied, the whole limb is to be evenly supported on a pillow.

It is calculated, that, on an average, the olecranon becomes firmly united about the twenty-sixth day. (*Desault par Bichat.*)

FRACTURES OF THE FINGERS.

On this subject, we need only remark, that the treatment consists in applying a piece of soap-plaster, rolling the part with tape, incasing it in pasteboard, sometimes placing the hand on a flat splint, or finger-board, and always keeping the hand, fore-arm, and elbow, well supported in a sling.

For Fractures of the Cranium see Head, Injuries of.

[Before concluding this article, it is highly proper to remark, that fractures in the limbs, treated by any of the preceding methods in some instances, do not form a bony union, but leave at the place of fracture a free motion in all directions, and, in fact, a joint. This is a most serious evil, and completely destroys the usefulness of the limb. In order to obviate the evil and produce a bony union of the parts, various remedies have been suggested and employed.

"Whether the fractured portions have passed one another, or whether an articulation has been formed between the fractured surfaces, if the fracture has been already of several months duration, the action of the fractured surfaces ought to be revived, by rubbing them forcibly one against the other, in order to excite the degree of inflammation necessary for the generation of calus. The fractured ends of the bones, having by this means acquired a disposition favourable to their agglutination, the apparatus should be re-applied, the extension continued if necessary, and the treatment prolonged until the cure be complete.

"If, notwithstanding these means, the pieces do not unite, there remains another and last resource, the cutting off of their extremities. This operation is painful, terrifying, and of dubious event. Its success, however, has been frequent enough to warrant the trial. It would be impracticable in fractures of the leg or fore-arm, on account of the difficulty of separating from the integuments the two bones of which each of these parts is formed, and on account of the numerous nerves and arteries which would be in danger of being wounded by the large incisions necessary for this operation, *it is therefore practicable only in the femur and humerus, especially the latter.*" (Boyer.)

Mr. Boyer proceeds to describe the manner of performing this operation, and relates a case in which it was done. The fracture was in the middle of the humerus—The patient aged thirty-six. Gangrene came on, and he died on the sixth day!

In other cases, amputation has been performed. Mr. Hunter proposed exposing the cavity between the ends of the bone, and hoped that this would occasion the necessary degree of inflammation. But a plan has been invented by Dr. Physick, which promises to supersede the horribly cruel and fatal operations hitherto in use, and to procure more effectually, than any

ever proposed, the cure of those unfortunate patients, in whom the artificial joints are formed.

In the Medical Repository, Hexade II. vol. 1. p. 122. is recorded a case of fracture, in which an artificial joint formed which was cured by this remedy.

The patient, Isaac Patterson, was admitted into the Pennsylvania Hospital in December, 1802. "I had seen," says Dr. Physick, "in our Hospital, when a student, in 1785, a case similar to this in every essential circumstance, in which an incision was made down to the extremities of the fractured bones, which were then sawed off, putting the parts into the condition of a recent compound fracture. No benefit, however, was derived from this painful operation; and some months afterwards the arm was amputated. This case had made a strong impression on my mind, and rendered me unwilling to perform a similar operation. I therefore proposed to the medical gentlemen of the hospital, who attended in consultation, that a seton needle, armed with a skein of silk, should be passed through the arm, and between the fractured extremities of the bone, and that the seton should be left in this situation, until by exciting inflammation and suppuration, granulations should arise on the ends of the bone, which uniting and ossifying, would form the bony union that was wanting. This operation, being agreed to, was performed on the 18th December, 1802, twenty months after the accident. Before passing the needle, I directed the assistants to make some extension of the arm, in order that the seton might be introduced as much as possible between the ends of the bone. Some lint and a pledget were applied to the orifices made by the seton needle, and secured by a roller.

"The patient suffered very little pain from the operation. After a few days, the inflammation (which was not greater than what is commonly excited by a similar operation through the flesh in any other part) was succeeded by a moderate suppuration. The arm was now again extended, and splints applied. The dressings were renewed daily for *twelve weeks*, during which time no amendment was perceived; but soon afterwards, the bending of the arm at the fracture was observed to be not so easy as it had been, and the patient complained of much more pain than usual,

whenever an attempt was made to bend it at that place. From this time the formation of the new bony union went on rapidly, and on the 4th May, 1803, was so perfectly completed, that the patient could move his arm in all directions, as well as before the accident happened. On the 28th May, he was discharged from the hospital perfectly well, and he has since repeatedly told me, that his arm is as strong as it ever was."

Dr. Physick has since effected another cure in the same manner. The operation, however, failed in a case which occurred at Baltimore. Here the cause of failure was, however, evident: The seton remained in the arm but six weeks, and was removed in consequence of the patient's ill health. She was very old and sickly. Twelve weeks had elapsed in Patterson's case, before any symptom of amendment was perceived.

We would urge, to any surgeon who may be disposed to avail himself of this remedy, the propriety of continuing the seton at least twelve weeks.]

For information on fractures consult particularly, *Petit's Traité des Maladies des Os*; *Duverney's Traité des Maladies des Os*; *W. Sharp in vol. 57. of the Philosophical Trans. part 2, 1767. Pott's Remarks on Fractures and Dislocations. Cases in Surgery by C. White, F. R. S. Edit. 1770. Boyer's Leçons sur les Maladies des Os, rédigées en un Traité complet de ces Maladies, par Richerand, or the English Translation by Dr. Farrell; Encyclopédie Méthodique, Partie Chirurgicale, Art. Fracture. Cuisse, Omoplate, Ilium, &c. &c. Œuvres Chirurgicales de Desault, par Bichat, Tom. 1. Parts of the Parisian Chirurgical Journal Richerand's Nosographie Chirurgicale, Tom. 3, Edit. 2 Levéillé's Nouvelle Doctrine Chirurgicale, Tom. 2, 1812.*

FRÆNUM LINGUÆ. (from *fræno*, to curb.) Occasionally it happens, in infants that their tongues are too closely tied down, by reason of the frænum being too short, or continued too far forwards towards the point. In the latter case, the child will not be able to use its tongue, with sufficient ease in the action of sucking, swallowing, &c. in consequence of the point being too much confined at the bottom of the mouth. Though this affection, however, is not unfrequent, yet, it is much less common, than it is generally supposed to be by parents and nurses. When the child is small, and the nurse's nipple large, it is common for her to suppose the child to be tongue-tied, when, in fact, it is only the smallness of the child's tongue, that prevents it from surrounding the nip-

ple, so as to enable it to suck with facility. Mothers also commonly suspect the existence of such an erroneous formation whenever the child is long in beginning to talk.

The reality of the case may always, however, be easily ascertained by examining the child's mouth. In the natural state, the point of the tongue is always capable of being turned upward towards the palate, as the frænum does not reach along about a quarter of an inch of the lower part of the tongue from the apex. But, in tongue-tied children, by looking upon one side, we may see the frænum extending from the back part to the very point, so that the whole length of the tongue from the back part to the very point, is tied down, and unnaturally confined in its motion.

The plan of cure is to divide, as much of the frænum as seems proper for setting the tongue at liberty. The incision, however should not be carried more extensively backward, than is necessary, lest the raninal arteries should be cut; an accident, that has been known to have proved fatal. For the same reason, the scissars, used for this operation, should have no points. I think the following piece of advice, offered by a modern author, may be of service to practitioners, who may find it necessary to divide the frænum linguæ: "It is not the relations of the trunk of the lingual artery alone, which the student ought to make himself acquainted with. He will do well to study the position of the arteria ranina in respect to the frænum linguæ. This information will teach him the impropriety of pointing the scissars upward and backward, when snipping the frænum, an operation bye the bye, oftener performed, than needed. He will learn, that the ranular artery lies just above the attachment of the frænum; so that if he would avoid it, he must turn the points of the scissars rather downward; if he do not, the artery will probably suffer." (*J. Burns on the Surgical Anatomy of the Head and Neck, p. 239.*)

When an infant has the power of sucking, this proceeding should never be resorted to, even though the frænum may have the appearance of being too short, or extending too far forwards. (*Fab. Hildanus, centur 3. Obs. 28; Petit, Traité des Maladies Chirurgicales, Tom. 3, p. 265, Edit. 1774.*)

Although the operation of dividing the frænum linguæ is for the most part done without any bad consequences, surgeons should remember well, that it is liable to dangers, especially, when performed either unnecessarily, or unskillfully.

Besides the fatal events, which have occasionally resulted from wounding the raninal arteries, the records of surgery furnish us with proofs, that the mere bleeding from the raninal veins, and the small vessels of the frænum may continue so long, in consequence of the infants' incessantly sucking, as to produce death. In such cases the child swallows the blood, as fast as it issues from the vessels, so that the cause of death may even escape observation. But, if the body be opened, the stomach and intestines will be found to contain large quantities of blood. (See *Dionis, Cours d'Opérations de Chirurgie, 7e Demonstration; and Petit's Traité des Maladies Chirurgicales, Tom. 3, p. 282, &c.*)

Another accident, sometimes following an unnecessary, or too extensive a division of the frænum, consists in the tongue becoming thrown backward over the glottis into the pharynx, where it lies fixed, and causes suffocation. The observations of Petit on this subject are highly interesting. (See *Op. cit. Tom. 3, p. 267, &c.*)

Lastly, it should be known, that an infants' inability to move its tongue, or suck, is not always owing to a malformation of the frænum. Sometimes the tongue is applied and glued, as it were, to the roof of the month, by a kind of mucous substance, and in this case, it should be separated with the handle of a spatula. By this means infants have been saved, which were unable to suck during several days, and were in imminent danger of perishing from want of nourishment. (See *Mémoires de l'Acad. de Chirurgie. Tom. 3. p. 16, Edit. 4to.*)

See particularly *Petit's Traité des Maladies Chirurgicales, Tom. 3, p. 260, &c. Dionis Cours d'Opérations, 7e Demonstr. Sabatier's Médecine Opératoire, Tom. 3, p. 152, &c. Lassus, Pathologie Chirurgicale, Tom. 2, p. 454. Richerand's Nosographie Chirurgicales, Tom. 3. p. 284. Edit. 2. Richter's Anfangsgründe des Wundarzneykunst, Band. 4, Kap. 2, p. 11. Edit. 1800.*

FRAGILITAS (from *frango*, to break.) *Fragilitas Ossium.* A morbid brittleness of the bones. The gelatinous part of the bones, to which they owe their flexibility, may be so deficient in them, that they are capable of being broken by the slightest causes. The state of a bone, thus dis-tempered, may be well conceived, from that of a calcined one.

Boyer imputes the *mollities ossium* to a deficiency of lime in their structure; the *fragilitas ossium* to a deficiency of the soft matter naturally entering into the texture of these parts. He states that a certain

degree of the *fragilitas ossium* necessarily occurs in old age, because the proportion of lime in the bones naturally increases as we grow old, while that of the organized part diminishes. Hence it is, that the bones of old persons more easily break, than those of young subjects, and that they are longer in uniting again.

In persons, who have long been afflicted with cancerous diseases, the bones are said occasionally to become as brittle, as if they had been calcined. Saviard and Louis relate such cases. The latter mentions a nun, who broke her arm by merely leaning on a servant; and in the London Medical Journal an account is given of a person, who could not even turn in bed, without breaking some of his bones.

The bones are said sometimes to be remarkably brittle in the latter stages of syphilis.

In bad cases of scurvy, the bones occasionally become so brittle, as to be broken by the slightest causes, and do not grow together again.

The *fragilitas ossium* of old age is incurable: that which depends on some other constitutional disease can only be relieved by a removal of the latter. (See *Boyer on Diseases of the Bones, Vol. 2.*)

FUMIGATION. (from *fumigo*.) *Fumigatio.* In surgery, means any application in the form of a steam, or vapour.

FUNGUS. (from *σφογλος*, a sponge.) Any sponge-like excrescence. Granulations, are often called *fungus* when they are too high, large, flabby, and unhealthy.

FUNGUS HÆMATODES. (from *fungus*, and *αἷμα*, blood.) *The Bleeding Fungus. Spongoid Inflammation. Soft Cancer. Carcinome Sanglante.*

This disease has only been accurately described of late years, having before been generally confounded with cancer. The public are indebted to Mr. Burns, of Glasgow, for the first good account of it; and the subsequent publications of Mr. Hey, of Leeds, Mr. Freer, of Birmingham, and Mr. J. Wardrop, have made us still better acquainted with the subject.

It is perhaps one of the most alarming diseases, incidental to the human body, because, we know of no specific remedy for it; and an operation can only be useful at a time, when it is very difficult to persuade a patient to submit to it.

Fungus Hæmatodes, is the name applied to it by Mr. Hey. Mr. Burns has called it *spongoid inflammation*, from the spongy elastic feel, which peculiarly characterizes it, and which continues even after ulceration takes place. The *fungus hæmatodes*

has most frequently been seen to attack the eyeball, the upper and lower extremities, the testicle, and the mamma. But, the uterus, ovary, liver, spleen, lungs, thyroid gland, hip and shoulder joints, have been the seat of the disease. A distemper, which presents itself in so many parts, must be subject to variety of its appearances.

Fungus Hæmatodes of the Eye.

1. When it attacks the eye, the first symptoms are observable in the posterior chamber. The pupil becomes dilated and immovable, and, instead of having its natural deep black colour, it is of a dark amber, and sometimes of a greenish hue. The change of colour becomes gradually more and more remarkable, and, at length, is discovered to be occasioned by a solid substance, which proceeds from the bottom of the eye towards the cornea. The surface of this substance is generally rugged and unequal, and ramifications of the central artery of the retina may sometimes be seen running across it. The front surface of the new mass, at length, advances as far forwards as the iris, and the amber, or brown appearance of the pupil, has, in this stage, been known to mislead surgeons into the supposition of there being a cataract, and make them actually attempt couching. The disease continuing to increase, the eyeball loses its natural figure, and assumes an irregular knobby appearance. The sclerotic also loses its white colour, and becomes of a dark blue, or livid hue. Sometimes, matter now collects between the tumour and the cornea. The latter membrane in time ulcerates, and the fungus shoots out. In a few instances, it makes its way through the sclerotic, and is then covered by the conjunctiva. The surface of the excrescence is irregular, often covered with coagulated blood, and bleeds profusely from slight causes. When the fungus is very large, the most prominent parts slough away, attended with a fetid sanious discharge. In the course of the disease the absorbent glands, under the jaw, and about the parotid gland, become contaminated. On dissection, a diseased mass is found extending forwards from the entrance of the optic nerve, the vitreous, crystalline, and aqueous humours being absorbed. The retina is annihilated, and the choroid coat propelled forwards, or quite destroyed. The tumour seems to consist of a sort of medullary matter, resembling brain. The optic nerve is thicker and harder than natural, of a brownish ash-colour, and destitute of its usual tubular appearance. In other cases, the

nerve is split into two or more pieces, the interspaces being filled up with the morbid growth. Even the brain has been observed to share in the disease, sometimes dark-red spots appearing on the dura mater; sometimes small spots, containing a fluid-like cream, being found between the pia mater and tunica arachnoides. When the lymphatic glands are enlarged, they are also found converted into a kind of medullary matter, similar to that which composes the diseased mass in the eyeball. When the skin bursts over a diseased absorbent gland, a sloughy ulcer is produced; but, no fungus is emitted, unless the affection of the gland with fungus hæmatodes be primary. Fungus hæmatodes of the eye has been erroneously regarded as cancer by the best writers. We learn from Bichat, that more than one-third of the patients on whom Desault operated for *supposed* carcinoma of the eye, were under twelve years of age. Twenty, out of twenty-four cases of fungus hæmatodes of the eye, with which Mr. Wardrop has been acquainted, happened to children under twelve years of age. Now, as cancer is rather a disease of aged, than young persons, and we find, from Mr. Wardrop, that fungus hæmatodes of the eye mostly affects persons under twelve years of age, it is tolerably certain, that most of Desault's cases, reported to be cancers of the eye, were in fact the equally terrible malady now engaging our consideration. The sight of young subjects is generally destroyed, before the attention of parents is excited to the distemper. Frequently, however, a blow, followed by ophthalmia, precedes the growth of the diseased mass. When no external violence has occurred, the first symptoms is a trivial fulness of the vessels of the conjunctiva, the iris becoming, at the same time, extremely vascular, and altered in colour, and the pupil dilated and immovable. There is seldom much complaint made of pain; but, the child is sometimes observed to be languid and feverish. In adults, the fungus hæmatodes of the eye generally comes on without any apparent cause, though sometimes in consequence of a blow. At first, the tunica conjunctiva is slightly reddened, and vision indistinct. The redness and obscurity of sight increase slowly, and an agonizing nocturnal headach is experienced, the eye bursts, and the humours are discharged.

With regard to the cure of the fungus hæmatodes of the eye, the only chance of effecting this desirable object depends upon the early extirpation of the diseased organ. It must be acknowledged, however, that most of the operations, in which

the morbid eye has been removed, have hitherto proved unsuccessful, owing to a recurrence of the disease. The reason of such ill success may be imputed to the optic nerve being almost always in a morbid state, before an attempt is made to remove the eye. The operation has always been found to fail, when the disease is advanced so far, that the posterior chamber is filled by the fungus mass. Since no internal medicines, nor external applications, afford the least hope of checking any form of the fungus hæmatodes, it is manifest, that, when the distemper of the eye exceeds certain bounds, the miserable patient is placed beyond the reach of any effectual aid from surgery. (See particularly *Wardrop's Observations on Fungus Hæmatodes.*)

Fungus Hæmatodes of the Limbs.

2. In the extremities the disease begins with a small colourless tumour, which is soft and elastic, if there be no thick covering over it, such as a fascia; but otherwise is tense. At first, it is free from unpleasantness; but, by degrees, a sharp acute pain darts occasionally through it, more and more frequently, and, at length, becomes incessant. For a considerable time, the tumour is smooth and even; but, afterwards, it projects irregularly at one or more points; and the skin at this place becomes of a livid red colour, and feels thinner. In this situation, it easily yields to pressure, but instantly bounds up again. Small openings now form in these projections, through which is discharged a thin bloody matter. Almost immediately after these tumours burst, a small fungus protrudes, like a papilla, and this rapidly increases, both in breadth and height, and has exactly the appearance of a carcinomatous fungus, and frequently bleeds profusely. The matter is thin, and exceedingly fetid, and the pain becomes of the smarting kind. The integuments, for a little way round these ulcers, are red, and tender. After ulceration takes place, the neighbouring glands swell, and assume exactly the spongy qualities of the primary tumour. If the patient still survive the disease in its present advanced progress, similar tumours form in other parts of the body, and the patient dies hectic.

After death, or amputation, the tumour is found to consist of a soft substance, somewhat like the brain, of a greyish colour, and greasy appearance, with thin membrane like divisions running through it, and cells, or abscesses, in different places, containing a thin bloody matter, occasionally in very considerable quantity. There does not seem uniformly to

be any entire cyst, surrounding the tumour; for, it very frequently dives down betwixt the muscles, or down to the bone, to which it often appears to adhere. The neighbouring muscles are of a pale colour, and lose their fibrous appearance, becoming more like liver, than muscle. The bones are always carious in the vicinity of these tumours.

The distemper is sometimes caused by external violence, though in general there is no evident cause whatever. (*Dissertations on Inflammation by J. Burns, Vol. 2.*)

Mr. Hey has given several cases of the fungus hæmatodes. If we notice the most particular circumstances, relative to one of these, it will suffice to inform our reader of the form, in which this terrible affliction has presented itself in this gentleman's practice.

A young man, aged twenty-one, two years before applying to Mr. Hey, perceived a small swelling on the inside of the right knee, not far from the patella. This tumour was moveable, and did not impede the motion of the joint; it was not discoloured, but was painful, when moved, or pressed upon. It continued in this state half a year, and then the man, having hurt his knee against a stone, it gradually increased in bulk, but did not exceed the size of an egg. The skin was now discoloured with blue specks, which were taken to be veins. He could still walk with ease, and follow his business.

Two months before his admission into the Leeds Infirmary, he met with a fall, and violently bent his knee, but did not strike it against any thing. The tumour began immediately to enlarge; and, within a few hours, it extended half way up the inside of his thigh. About a fortnight after this accident, the skin burst at the lowest part of the tumour, and discharged some blood. A dark-coloured fungus, about the size of a pigeon's egg, here made its appearance, and, a few weeks afterwards, the skin burst at another part of the large tumour, and some blood was again discharged. From the fissure arose another fungus, which had increased, in the course of the last week, to the size of a small melon, and now measured eight inches from one side of its base to the other. The base of the fungus frequently bled, especially, when the man allowed his limb to hang down.

The whole tumour was now of an enormous size, being nineteen inches across, when the measure was carried over the last-mentioned fungus. From its highest part in the thigh to the lowest part, just below the knee, it measured seventeen inches, without including the fungus. The base of the tumour at the knee, ex-

clusive of that part, which ran up the thigh, measured twenty-four inches in circumference. The tumour was situated on the inner side of the limb, and was distinctly defined. The skin, covering the disease, was in some places livid, and had several fissures and small ulcerations upon it; but, had not burst asunder, except in the two places above described. The tumour was soft, and gave a sensation of some contained fluid, when gently pressed with the hands alternately in opposite directions. The patient said he had walked without pain in his knee a week before his admission into the Infirmary; he had lost very little blood in his journey to Leeds. He complained of the greatest uneasiness in the highest part of the tumour. It had become hot and painful in the night-time, for some days past. His pulse was 114 in a minute; his tongue was clean; and his appetite had been good, till the last few days. He had never felt any pulsation in the tumour.

In a consultation it was determined, that the tumour should be laid open, by cutting off a portion of the distended integuments: and that after removing the contents, if the sac should be found in a sound state, the disease should be treated as a simple wound; but, in a morbid state, amputation of the limb should be immediately performed.

A large oval piece of the integuments being removed, the tumour was found to contain a very large quantity of a substance, not much unlike coagulated blood; but more nearly resembling the medullary part of the brain in its consistence and oily nature. It was of a variegated reddish colour, in some parts approaching to white, and, as blood issued from it, Mr. Hey conceived it was organized. This mass was partly diffused through the circumjacent parts in innumerable pouches, to which it adhered, and was partly contained in a large sac of an aponeurotic texture, which was connected with the capsule of the kneejoint. There was a great and universal effusion of blood, from the internal surface of the sac, and from the pouches, containing this morbid mass.

Amputation of the limb was immediately performed, on finding such to be the nature of the case. Mr. Hey, unfortunately, however, left a portion of the diseased surface behind on the inner part of the thigh, and hoping, that a small narrow portion of the upper part of the sac would soon become a clean sore, and not impede the cure, he made the circular incision two inches below its higher part.

On examining the amputated limb, the

vastus internus was found to be brown, and much softer, than the other muscles, which were healthy. There were many small portions of blood extravasated in the substance of this muscle. The sac was formed of the aponeurotic covering of the muscle, and ended below where this aponeurosis begins to cover the capsular ligament of the knee. The two fungous substances, above described, appeared to have been only extensions of the morbid mass, where this had made its way through the sac and the integuments. The joint of the knee, and muscles of the leg, were perfectly sound.

I need not detail all the particulars after the operation. Suffice it to say, the man suffered a great deal of constitutional disorder. After a few weeks, the granulations upon the stump became good, and the cicatrization was nearly completed at the end of the sixth week, after the amputation. At this period, that small and superficial portion of the upper part of the great sac, which Mr. Hey had unfortunately left, was now healed; but, a tumour, now about four inches in length, and between two and three in breadth, had gradually risen at the lower and under part of the thigh, beneath the cicatrix. This contained a soft substance, exactly similar, as far as the touch could discover, to that which had filled the large sac. This tumour became painful, and sometimes discharged a bloody serum, sometimes dark-coloured blood, through four or five, small openings in the cicatrix.

Mr. Hey laid open the tumour, and removed its contents; but no advantage was gained by this proceeding. The interior surface was found to be too much diseased to produce good granulations. Blood continued to ooze out of the wound for a few days. Then the inner surface became covered with a blackish substance, which gradually extended itself, and formed a new fungus. A variety of escharotics were applied to destroy the fungus and morbid surface of the wound; but to no purpose, the growth of the fungus always exceeded the quantity destroyed. Undiluted oil of vitriol, applied freely, had very little effect.

An attempt was once more made to cut away the disease; but, on examining the wound carefully, after the contained substance was removed, the muscular substance was found degenerated into a hard mass, which felt somewhat like cartilage. The adipose membrane was also diseased, and formed into large cells, which had contained the fungous substance. Hence, another amputation seemed the only resource.

After this operation, the whole surface

of the stump seemed sound, except the principal artery, which was filled with a somewhat stiff matter, resembling coagulated blood, which prevented its bleeding. The inside of the vessel, on being touched with the scalpel, felt hard, and communicated a sensation, like that of scraping bone.

The man was sent home, as soon as his state would admit of it; but, he died consumptive about six months afterwards. Besides this instance, in the thigh, Mr. Hey relates cases of fungus hæmatodes, situated in the female breast, in the leg, in the neck (extending from the jaw to the clavicle, and producing suffocation), on the back part of the neck, on the back part of the shoulder, and at the extremity of the fore-arm near the wrist.

"If I do not mistake, (says Mr. Hey,) this disease not unfrequently affects the globe of the eye, causing an enlargement of it, with the destruction of its internal organization. If the eye is not extirpated, the sclerotis bursts at the last, a bloody sanious matter is discharged, and the patient sinks under the complaint." (P. 283.)

Besides some cases, in similar situations, to those mentioned by Mr. Hey, one is related by Mr. Burns, in which the hip-joint was the seat of this terrible affection. After detailing the progress of the case to the poor man's death, this author states, that he found, on dissection, the hip-joint completely surrounded with a soft matter, resembling the brain, inclosed in thin cells, and here and there cells full of thin bloody water; the head of the thigh-bone was quite carious, as was also the acetabulum. The muscles were quite pale, and almost like boiled liver, having completely lost their fibrous appearance, and muscular properties. The same sort of morbid mischief was also found within the pelvis, most of the inside of the bones, on the affected side, being quite carious. An attempt had been made, before the patient died, to tap the bladder; but, the trocar had only entered a cell, filled with bloody water, and situated in a mass of the soft brain-like substance.

We have already said enough, to render the description of the dreadful nature of the fungus hæmatodes tolerably complete. Little can be said of the treatment; for, we know of no one medicine that seems to have the least power of putting a stop to the disease, and we have no reason to believe, that there is ever the smallest chance even of any spontaneous amendment, much less of such a cure.

We have seen, that when the chief part

of a fungus hæmatodes is cut away, and only a small portion of its cyst is left behind, that the fungus is reproduced from this part, and soon becomes as formidable, nay more formidable, than it was before, and this notwithstanding the application of the most powerful escharotics. Neither the hydrargyrus nitratus ruber, the hydrargyrus muriatus, the antimonium muriatum, nor the undiluted viriolic acid, have always been able to repress the growth of such fungus. (Hey.)

There is no remedy, that has the power of checking, or removing the complaint. Friction, with anodyne balsams, sometimes gives relief in the early stages; but, it does not seem to retard the progress of the disease.

In short, the only chance of cure consists in extirpating the whole of the distempered parts, removing not only the soft, brain-like fungous substance, but every particle of the cysts, sacs, or pouches, in which it may be contained. An operation of this kind, however, is only advisable in the early stages, while the disease is entirely local; for, after the neighbouring glands have become affected, the chance of recovery is almost destroyed. It is sometimes difficult, however, to persuade patients at this time to submit to amputation, or extirpation, because the pain and inconveniences are inconsiderable; but, the operation ought to be urged with all the force, which a conviction of its absolute necessity, and, the fatal peril of delay, ought to inspire.

The attempts to cure the disease, by cutting it away, have been attended with such ill-success, that some surgeons deem it advisable not to follow this method, but amputate the limb at once. The annexed views of the matter appear to me to be most judicious and rational. First, that if an attempt be made to cut away the tumour, and save the limb, the surgeon must be careful to remove, at the same time, a considerable quantity of the soft parts in the circumference of the swelling. Secondly, that the earlier this is done, the more likely is it to succeed. Thirdly, that after the tumour is taken out, an attentive examination of the surface of the wound should be made, and every suspicious part, or fibre, be cut away. Fourthly, that should the disease still recur, amputation ought to be instantly performed. Fifthly, that caustic should never be applied to this disease. Sixthly, that, even when one of these operations effectually extirpates the distemper of the limb, the patient's entire recovery is always rendered exceedingly uncertain, by reason of the viscera, and other in-

visible parts, being frequently affected, at the time of the operation, with the same sort of disease.

FUNGUS HÆMATODES OF THE TESTICLE.

3. Fungus hæmatodes of the testicle sometimes begins in its glandular part, sometimes in the epididymis. Its progress is slow, and the pain generally not severe. Nor is there, at first, any inequality, or hardness of the diseased part, nor change in the scrotum. When the testicle has become exceedingly large, it feels remarkably soft and elastic, as if it contained a fluid. Hence, the case has often been mistaken for an hydrocele, and punctured with a trocar. (*Wardrop*.) Occasionally, when the tumour is large, it is in some places hard, in others soft. The hydrocele may be known by the water beginning to collect at the bottom of the scrotum, and then ascending towards the spermatic cord, and by the swelling being circumscribed towards the abdominal ring; whereas the fungus hæmatodes begins with a gradual enlargement of the testicle itself, followed by a fulness, which extends up the spermatic cord. As the disease advances, abscesses form, and the scrotum ulcerates; but no fungus shoots out. When the inguinal glands become contaminated, they often acquire an immense size; and when the skin over them bursts, large portions of them slough away. Fungus hæmatodes of the testicle is said to afflict young subjects more frequently than old ones. On dissection, the substance of the diseased testicle is found to present a medullary, or pulpy appearance, generally of a pale brownish colour, though sometimes red. In most cases, the tunica vaginalis and tunica albuginea are adherent together; occasionally, there is fluid between them. The only chance of a cure must be derived from a very early performance of castration, before the disease has extended to the inguinal glands, or far up the spermatic cord.

We shall quit this subject with stating some of the principal differences between two diseases, which have been commonly confounded. A scirrhus tumour is, from its commencement, hard, firm, and incompressible, and is composed of two substances: one hardened and fibrous, the other soft and inorganic. The fibrous matter is the most abundant, consisting of septa, which are paler than the soft substance between them. A scirrhus tumour, situated in a gland, is not capable of being separated from the latter part, so much are the two structures blended. A scirrhus, in another situ-

ation, sometimes condenses the surrounding cellular substance, so as to form a kind of capsule, and assume a circumscribed appearance. When a scirrhus swelling ulcerates, a thin ichor is discharged, and a good deal of the hard fibrous substance is destroyed by the ulceration; other parts become affected, and the patient dies from the increased ravages of the disease, and its irritation on the constitution. Sometimes, though not always, after a scirrhus has ulcerated, it emits a fungus of a very hard texture. Such excrescence, however, is itself at last destroyed by the ulceration. Cancerous sores, also, frequently put on, for a short time, an appearance in some places of cicatrization. On the other hand, the fungus hæmatodes, while of moderate size, is a soft elastic swelling, with an equal surface, and a deceitful feel of fluctuation. It is, in general, quite circumscribed, being included within a capsule. The substance of the tumour, instead of being for the most part hard, consists of a soft, pulpy, medullary matter, which readily mixes with water. When ulceration occurs, the tumour is not lessened by this process, as in scirrhus; but a fungus is emitted, and the whole swelling grows with increased rapidity. Cancerous diseases are mostly met with in persons of advanced age, while fungus hæmatodes generally afflicts young subjects. (*Wardrop*)

See *Dissertations on Inflammation*, by J. Burns. Vol. 2. *Key's Practical Observations in Surgery* Freer on Aneurism, and particularly *Observations on Fungus Hæmatodes, or Soft Cancer*, by James Wardrop. Edin. 1809. In the third volume of the *Medico-Chirurgical Transactions*, about to be published, I believe, some further interesting cases of fungus hæmatodes will be laid before the public.

A case of this disease is related in Vol. 5, of the *London Medical Journal*. It was the consequence of an attempt to cure a ganglion by means of a seton, and it proved fatal. A case is also related by Mr. Abernethy in *Surgical Observations*, 1804, p. 99.

The medullary sarcoma, which is considered by Mr. Wardrop, as the same affection as the fungus hæmatodes, is described in the article, *Tumours*.

FURUNCULUS. (from *furo*, to rage.) A boil, so named from the violence of the heat and inflammation attending it.

A boil is a circumscribed, very prominent, hard, deep-red inflammatory swelling, which is exceedingly painful, and commonly terminates in a slow and imperfect suppuration. The figure of the tumour is generally that of a cone, the base of which is considerably below the

surface. Upon the most elevated point of the boil, there is usually a whitish, or livid pustule, which is exquisitely sensible, and immediately beneath this is the seat of the abscess. The matter is mostly slow in forming, is seldom very abundant, never healthy, at first, being always blended with blood. The complaint is seldom attended with fever, except, when the tumour is very large, situated on a sensible part, or when several of these swellings occur at the same time in different places. In the last circumstance, they often occasion in children, and even in irritable adults, restlessness, loss of appetite, spasms, &c. They rarely exceed a pigeon's egg in size, and they may originate on any part of the body.

Boils commonly arise from constitutional causes. Young persons, and especially subjects of full plethoric habits, are most subject to them. The disease is also observed to occur with most frequency in the spring. (*Lassus, Pathologie Chirurgicale, Tom. 1, p. 16*) According to Richerand, the origin of boils depends upon a disordered state of the gastric organs. (*Nosographie Chirurgicale, Tom 1, p. 124, Edit 2.*)

The suppuration that attends a boil, is never perfect, and the matter, which forms, is not only tinged with blood, but surrounded with a sloughy substance, which must generally be discharged, before the part affected will suppurate kindly, and the disease end. Richter compares the slough with a kind of bag, or cyst, and the whole boil with an inflamed encysted tumour.

The best plan is mostly to endeavour to make boils suppurate, as freely as possible, by applying external emollient remedies. This seems to be the natural course of the disease in its progress to a cure, and, indeed, all endeavours to discuss furunculous tumours commonly fail, or succeed very imperfectly; only removing the inflammation, and leaving behind an indolent hardness, which occasions various inconveniences, according to its situation, every now and then inflames anew, and never entirely disappears, until a free suppuration has been established.

In a very few cases, perhaps, it may be proper to try to discuss boils. For this purpose, besides bleeding, gentle evacuations, and a low diet, which are requisite in this, as well as other local inflammations, some prescribe as external applications honey strongly acidulated with sulphuric acid; alcohol; or camphorated oil.

But, in the generality of instances, suppuration must be promoted, by the

use of emollient poultices. The tumour, when allowed to burst, generally does so at its apex. However, as the opening, which spontaneously occurs, is generally long in forming, and too small to allow the sloughy cellular substance to be discharged, it is always best, as soon as matter is known to exist in the tumour, to make a free opening with a lancet, and immediately afterwards to press out as much of the matter and sloughs, as can be prudently done. This having been accomplished, and the rest of the sloughs pressed out, as soon as it is practicable, healthy pus will be secreted, and the part will granulate and heal. Until the suppuration becomes of the healthy kind, and the sloughy substances are entirely discharged, an emollient linseed poultice is the best application, and when granulations begin to fill up the cavity, plain lint, and a simple pledget, are the only dressings necessary.

Where there is reason to suppose the gastric organs to be in a disordered state, an emetic should be given in the early part of the treatment, and afterwards small repeated doses of any of the mild purging salts.

When an indolent hardness continues, after the inflammatory, and suppurative state of boils has been cured, the part should be rubbed with camphorated mercurial ointment.

Besides the above *acute* boil, authors describe a *chronic* one, which is said frequently to occur, in subjects, who have suffered severely from the small-pox, measles, lues venerea, scrofula, and in constitutions, which have been injured by the use of mercury.

The *chronic* boil is commonly situated upon the extremities, is of the same size as the acute one, has a hard base, is not attended with much pain, nor any considerable discolouration of the skin, until suppuration is far advanced, and the matter is seldom quite formed, before three, or four weeks. This, like the former, sometimes appears in a considerable number at a time. The discharge is always thinner, than good pus, and when the boil is large, and has been long in suppurating, a great deal of sloughy cellular membrane must be cast off, before the sore will heal.

The principal thing, requisite in the local treatment of all furunculous, and carbuncular tumours, is to make an early free opening into them, and to press out the matter and sloughs, employing emollient poultices, till all the morbid parts are detached and removed, and afterwards simple dressings. (See *Pearson's Principles of Surgery. Richter's Anfangs-*

grunde der Wundarzn. Band. 1. Lassus, Richerand Nosographie Chirurgicale, Tom Pathologie Chirurgicale, Tom. 1, p. 15. 1, p. 123, Edit, 2.)

G.

GANGLION, (γᾱῖλιον.) In anatomy, a knot in the course of a nerve; in surgery, a tumour on a tendon, or aponeurosis.

A ganglion is an encysted, circumscribed, moveable swelling, commonly free from pain, causing no alteration in the colour of the skin, and formed upon tendons in different parts of the body, but, most frequently, upon the back of the hand, and over the wrist. A French gentleman consulted me some time ago, who had one upon the upper part of his foot, which created a great sensation of weakness in the motion of the foot, and I have taken notice, that ganglions occur particularly often just below the kneecap, in housemaids, who are in the habit of kneeling a great deal in order to scour rooms. It is curious to remark, that pressure, which is the best common means of getting rid of ganglions, in this instance, appears to act as a cause.

These tumours, when compressed, seem to possess considerable elasticity. They often occur unpreceded by any accident; frequently, they are the consequence of bruises and violent sprains. They seldom attain, a considerable size, and ordinarily are not painful, though every now and then there are instances to the contrary. When opened, they are found to be filled with a viscid transparent fluid, resembling white of egg. If they do not disappear of themselves, or are not cured, while recent, by surgical means, they, in some cases, become so large, that they cause great inconvenience, by obstructing the motion of the part, and rendering it painful.

Discutient applications sometimes succeed in curing ganglions, and, in this country, friction with the oleum origani is a very common method. I have often seen such tumours very much lessened by this plan of treatment, but seldom cured, and, no sooner has the friction been discontinued, than the fluid in the cyst has in general accumulated again.

Compression is usually more effectual, than discutient liniments. Persons with ganglions have been recommended to rub them strongly with their thumb, several

times a day. After this has been repeated very often, the tumour is said sometimes to have absolutely disappeared while the friction was employed. But, the best method is to make continual pressure on ganglions, by means of a piece of sheet-lead, bound upon the part with a bandage. There is no objection, however, to using once, or twice a day, in conjunction with this treatment, frictions with the oleum origani, or camphorated mercurial ointment, provided these measures together do not seem likely to make the tumour inflame, an event, which should always be carefully avoided. Ganglions, when irritated too much, have been known to become most malignant diseases.

Setons have been recommended to be introduced through ganglions, with a view of curing them. This method, however, is not an eligible one, for, it is by no means free from danger, as the records of surgery fully shew. Cancerous diseases, and even the fungus hæmatodes (*Med. Journal Vol. 5*) have arisen from the irritation of a seton passed through a ganglion.

Frequently, when a ganglion inflames, and ulcerates, the cyst throws out a fungus, which is of a very malignant nature. Hence, the practitioner should avoid making an opening into the swelling, or doing any thing, which is likely to occasion sloughing, or ulceration of the disease. Ganglions may be cured by pressure, of such force, as to rupture the cyst, and some authors have recommended putting the hand affected upon a table, and then striking the ganglion several times with the fist, or a mallet. The cyst of a recent ganglion may also be burst, by compressing it strongly with the thumbs, with or without the intervention of a piece of money; the fluid is effused into the adjacent cellular membrane; and, pressure being now employed, the opposite sides of the cavity become united by the adhesive inflammation, and the recurrence of the disease is prevented. (See *L'Encyclopedie Méthodique, Partie Chirurgicale, art. Ganglion; Lassus, Pathologie Chirurgicale, Tom. 1, p.*

400, &c.; *Levéillé, Nouvelle Doctrine Chirurgicale, Tom. 3, p. 7.*)

In almost every instance, a ganglion may be cured by pressure and friction, and, if not actually cured, the disease may be rendered so bearable by these means, that few patients would choose to have the tumour cut out. Under this plan, the swelling becomes very much diminished, and, should it enlarge again, the mode of relief is so simple, and the case so little troublesome, that patients generally content themselves with every now and then wearing a piece of lead on the part.

But when ganglions resist all attempts to disperse, or palliate them; when they become extremely inconvenient, either by obstructing the functions of a joint, or causing pain; these tumours should be carefully dissected out, by first making a longitudinal incision in the skin covering them, then separating the cyst on every side from the contiguous parts, and lastly cutting every particle of it off the subjacent tendon, or fascia. The greatest care must be taken, not to make any opening in the cyst, so as to let out its contents, and make it collapse; a circumstance, which would render the dissection of it entirely out much more difficult.

The operation being accomplished, the skin is to be brought together with sticking plaster, and a compress placed over the situation of the tumour, with a view of healing the wound and the cavity by adhesion.

When the ganglion has burst, or is ulcerated, it is best to remove the diseased skin, together with the cyst, and of course the incision must be oval, or circular, as may seem most convenient. The grand object is not to allow any particle of the cyst to remain behind, as it would be very likely to throw out a fungus, and prevent a cure. In Warner's Cases of Surgery is an account of two considerable ganglions, which this gentleman thought it right to extirpate. These had become adherent to the tendons of the fingers. In the operation, he was obliged to cut the transverse ligament of the wrist, and the patients, who before could not shut their hands, nor close their fingers, perfectly regained the use of these parts. Mr. Gooch relates a case of the same kind, which had been occasioned by a violent bruise, three, or four, years before. The tumour reached from the wrist to the middle of the hand, and created a great deal of pain. Mr. Gooch extirpated it, and then restored the position of the hand, and free motion of the joint, by the use of emollient applications, and suitable pressure, made with

a machine constructed for the purpose. Other cases, confirming the safety of cutting out ganglions, are recorded in the London Medical Journal for 1787, p. 154; and by Eller, in *Mém. de l'Acad. des Sciences de Berlin, Tom. 2, ann. 1746.*

The ganglions, which occur just below the knee, I have seen cured by a little blister applied over them, and kept open with the savin cerate.

For information, relative to ganglions, consult *Warner's Cases in Surgery. Chirurgical Works of B. Gooch, Vol. 2. p. 376. Heister's Surgery. B. Bell's Surgery. Latta's System of Surgery. L'Encyclopédie Méthodique; Partie Chirurgicale; art. Gironelle. Richter's Anfangsgrunde der Wundarzneykunst, Band. 1. Lassus, Pathologie Chirurgicale, Tom. 1. p. 399.*

GANGRÆNA ORIS. See *Cancrum Oris.*

GANGRENE. (from γαίω, to feed upon.) *Gangræna.* An incipient mortification, so named from its eating away the flesh.

Authors have generally distinguished mortification into two stages; the first, or incipient one, they name *gangrene*, which is attended with a sudden diminution of pain in the place affected; a livid discolouration of the part, which from being yellowish, becomes of a greenish hue; a detachment of the cuticle, under which a turbid fluid is effused; lastly, the swelling, tension, and hardness, of the previous inflammation, subside, and, on touching the part, a crepitus is perceptible, owing to the generation of air in the gangrenous parts.

Such is the state, to which the term *gangrene* is applied.

When the part has become quite cold, black, fibrous, incapable of moving, and destitute of all feeling, circulation, and life; this is the second stage of mortification, termed *sphacelus*. Gangrene, however, is frequently used synonymously with the word mortification. (See *Mortification.*)

GANGRENE SCORBUTIQUE DES GENCIVES. See *Cancrum Oris.*

GASTRITIS. (from γαστήρ, the stomach.) An inflammation of the stomach.

GASTROCELE. (from γαστήρ, the stomach, and κηλη, a tumour.) A hernia of the stomach.

GASTRORAPHIA, OR GASTRORAPHE. (from γαστήρ, the belly, and ραφή, a suture.) A suture of the belly, or some of its contents.

Although the term *gastroraphe*, in strictness of etymology, signifies no more, than

sewing up any wound of the belly, yet Mr. Samuel Sharp informs us, that, in his time, the word implied, that the wound of the abdomen was complicated with another of the bowels.

The moderns, I think, seem to limit the meaning of the word to the operation of sewing up a wound of the parietes of the abdomen.

What was formerly meant by gastroraphe could scarcely ever be practised, because the symptoms laid down for distinguishing when an intestine is wounded, do not with any certainty determine in what particular part it is wounded; which want of information, makes it absurd to open the abdomen in order to get at it. Hence, the operation of stitching the bowels can only take place, when they fall out of the abdomen, and when we can see where the wound is situated.

The circumstances, making the practice of sewing up a wounded intestine proper, are so rare, that Du Verney, who was the most eminent surgeon in the French army a great many years during the wars, and fashion of duelling, declared, he never had once an opportunity of practising the gastroraphe, according to the former acceptation of that word.

Upon the supposition of the intestine being wounded in such a manner as to require the operation, Mr. Sharp advises taking a straight needle with a small thread, laying hold of the bowel with your left hand, and sewing up the wound with the glover's stitch, that is, by passing the needle through the lips of the wound from within outwards all the way, so as to leave a length of thread at both ends, which are to hang out of the incision of the abdomen. He then directs you carefully to make the interrupted suture of the external wound, and to pull the bowel by the small threads into contact with the peritoneum, for the more readily uniting with it afterwards by adhesion; though he seems to think it would be more secure to pass the threads with the straight needle through the lower edges of the wound of the abdomen, which would more certainly hold the intestine in that situation. In about six days, the ligature of the intestine will be loose enough to be drawn away; in the interim, superficial dressings are to be applied, and the patient kept on low diet. (*Sharp*)

On this operation, we have only to remark, that as the only use of a suture of the bowel is to keep the wound of it near the external wound, in case any extravasation should occur, this object can be as effectually accomplished by one fine stitch, as by sewing up all the breach in the in-

testine, and without being so likely to excite inflammation of the parts. We shall add no more concerning sutures of the bowels, to what is contained in the articles *Abdomen* and *Hernia*.

Gastroraphe, or merely sewing up a wound of the parietes of the abdomen, may be done, as Mr. Sharp explains, with the common interrupted suture, (see *Suture*) or with the quilled one, which is better, as follows:

A ligature, capable of splitting into two, has a needle attached to each end of it. The operator is to put the index finger of his left hand into the wound, under the lip furthest from him. This finger is in contact with the peritoneum, in order that it may with the thumb pinch up, and raise the whole thickness of the parietes. With the other hand, one of the needles is to be introduced into the abdomen, guiding its point on the index finger, in order to avoid wounding the omentum, or intestines. The lip of the wound is to be pierced, from within outward, about an inch from its edge. The other needle is to be passed in the same way through the opposite lip. Then the two needles are to be cut off. As many such sutures must be made, as the extent of the wound may require.

The sides of the wound are next to be brought together, and we are to prepare to tie the ligatures, not in a bow, in the way of the interrupted suture, because the continual action of the abdominal muscles might make the ligatures cut their way through the parts. It is better, to divide each end of the ligatures into two portions, and to tie these over a piece of bougie laid along the line at which the ligatures emerge from the flesh. This is to be done to all the ligatures on one side first. Then the wound being closed, another piece of bougie is to be placed along the other lip of the wound, and the opposite ligatures tied over it, with sufficient tightness, to keep the sides of the wound in contact. This suture is certainly preferable to the interrupted one, because a great deal of its pressure is made on the two pieces of bougie, and of course it is less likely to cut its way out. Its operation is to be assisted with compresses laid over each side of the wound, and the uniting bandage. Every thing, that puts the abdominal muscles into action, drags the suture, irritates the wound, and creates a risk of the threads cutting their way through the part, in which they are introduced; consequently, it must be avoided. To prevent, as much as possible, the exertion of the muscles, the bowels should be kept open with clysters; and opium is the best thing for putting a

stop to the vomiting, sometimes attendant on wounds of the abdomen, and producing very injurious effects, in regard to the wound.

In about a week, the sutures may generally be removed, and sticking plaster alone employed. As to what more relates to these particular cases, we must refer to *Abdomen, Wounds of*.

It is generally allowed, that sutures are violent means, to which we should only resort, when it is impossible to keep the lips of a wound in contact by the observance of a proper posture, and the aid of a methodical bandage. M. Pibrac believes such circumstances exceedingly uncommon, and in his excellent production, in the third volume of the Memoirs of the Royal Academy of Surgery, relative to the abuse of sutures, cases are related, which fully prove, that wounds of the belly readily unite by means of a suitable posture and a proper bandage, without having recourse to gastroraphie. These, however, are less decisive and convincing, (if possible to be so) than the relations of the Cæsarean operation, the extensive wound of which has oftentimes been healed by these simple means, after the failure of sutures. It is not only possible to dispense with gastroraphie in the treatment of wounds of the abdomen, it has ever been manifested, that this operation has sometimes occasioned very bad symptoms.

Under certain circumstances, however, it may be essentially necessary to practise gastroraphie. For instance, were a large wound to be made across the parietes of the abdomen, a suture might become indispensably requisite, to prevent a protrusion of the bowels. Yet, even in this case, the sutures should be as few in number as possible.

A bandage of the eighteen-tailed kind, might prove very useful in a longitudinal wound of the abdomen, and do away all occasion for gastroraphie. (See *Sutures*.)

We shall conclude this article with a fact, perhaps more curious, than instructive, related by M. Bordier, of Pondicherry, in the *Journal de Médecine*, vol. 26. 538. An Indian soldier, angry with his wife, killed her, and attempted to destroy himself by giving himself a wound with a broad kind of dagger in the abdomen, which caused a protrusion of the bowels. A doctor of the country, being sent for, dissected between the muscles and skin, and introduced there a thin piece of lead, which kept up the bowels. The wound soon healed up, the lead having produced no inconvenience. The man was afterwards hung, and M. Bordier, when the body was opened, assured

himself more particularly of the fact. Indeed, numerous cases prove, that lead may lodge in the living body, without occasioning the inconvenience, which results from the presence of almost any other kind of extraneous body.

See *Le Dran's Opérations de Chirurgie*. *Sharp's Treatise on the Operations of Surgery*. *L'Encyclopédie Méthodique; Partie Chirurgicale*, art. *Gastroraphie*; *La Médecine Opératoire par Sabatier*, Tom 1.

GASTROTOMIA. (from *λαση*, the belly, and *τεμνω*, to cut.) The operation of opening the abdomen and uterus. The Cæsarean operation. It also signifies opening of the abdomen for other purposes.

GLAUCOMA. (from *γλαυκος*, blue.) A disease of the eye, in which the crystalline lens becomes of a blue, or sea-green colour. The exact meaning of this ancient term, however, is very undetermined; some say, it is a disease of the crystalline; others, that it is an affection of the vitreous humour. Galen in his book *de usu pinctum* imputes glaucoma to a morbid dryness of the crystalline; in which sentiment he has been followed by Ætius, and Maître-Jan, at the commencement of the 18th century. Since, however, the cataract has been decidedly ascertained to depend upon a disease of the crystalline; the term glaucoma, has been reserved for an opacity of the vitreous humour, as we may learn from Heister, Platner, and all the oculists, who published about the middle of the last century. Lancisi mentions, that he once found the vitreous humour cartilaginous; and Morand has seen it converted into a stony substance. These instances, and some others, are in favour of the opinion, that glaucoma may arise from an opacity of the vitreous humour. A glaucoma, even of a confirmed kind, cannot always be easily distinguished from a cataract, especially, while the latter is in an incipient state. It is said, however, that suspicions of the disease may be entertained, when the unnatural colour, which characterizes it, is reflected from a deep surface, behind the pupil; whereas the opacity of a cataract is more superficial, and nearer to the margin of the uvea.

Glaucoma is certainly an exceedingly uncommon disease. Authors recommend applying blisters, and giving internally the extract of cicuta, calomel, and soap, (*Encyclopédie Méthodique; Partie Chir.*) The topical use of ether may also be tried, which we have mentioned, as one of Mr. Ware's remedies for promoting the absorption of cataracts.

From our present knowledge of the power of the absorbents to remove opaque

substances in the eye, when such are detached and loose, as they actually become after being disturbed with a couching needle, there can be no doubt that, if an opacity of a part of the vitreous humour were to present itself in practice, and not yield to the above means, it would be justifiable conduct, on the part of the surgeon, to endeavour to move such opacity out of the axis of sight, and at all events, to disturb it so freely with a couching needle, as to afford a chance of its being absorbed.

GLAUCOSIS, same as *Glaucoma*.

GLEET. By the term *gleet*, we commonly understand a continued running, or discharge, after the inflammatory symptoms of a clap for some time have ceased, being unattended with pain, scalding in making water, &c. Mr. Hunter remarks, that it differs from a gonorrhœa in being uninfected, and in the discharge consisting of globular bodies, contained in a slimy mucus, instead of serum. He says, that a gleet seems to take its rise from a habit of action, which the parts have contracted. The disease, however, sometimes stops of itself, even after every method has been ineffectually tried. This probably depends upon accidental changes in the constitution, and not at all upon the nature of the disease itself. Mr. Hunter suspected some gleets were connected with scrophula. The sea bath cures more gleets, than the common cold bath, or any other mode of bathing. An injection of diluted sea-water cures some gleets, though it is not always effectual.

Gleets are always attended with a relaxed constitution. They also sometimes arise from other affections of the urethra, besides gonorrhœas. A stricture is almost always attended with a gleet; so sometimes is disease of the prostate gland.

When a gleet, observes, Mr. Hunter, does not arise from any evident cause, nor can be supposed to be a return of a former gleet, in consequence of a gonorrhœa, either a stricture or diseased prostate gland is to be suspected; an enquiry should be made whether the stream of urine is smaller than common, whether there be any difficulty in voiding it, and whether the calls to make it are frequent. If there should be such symptom, a bougie, rather under the common size, should be introduced; and, if it passes on to the bladder with tolerable ease, the disease is probably in the prostate gland, which should next be examined. (See *Urethra, Strictures of; and Prostate Gland, Diseased*.)

Balsams, turpentine, and cantharides, given internally, are of use, especially in slight cases; and when they are useful, prove so almost immediately. Hence, if

they neither lessen nor remove the gleet in five or six days, Mr. Hunter never continued them longer. As the discharge, when removed, is also apt to recur, such medicines should be continued for some time after the symptoms have disappeared.

The cold bath, sea-bath, bark, and steel, may be given when the whole constitution is weak. The astringent gums, and salt of steel, given as internal astringents, have little power.

With regard to local applications; the astringents commonly used are, the decoction of bark, white vitriol, alum, and preparations of lead. The aqua vitriolica, carules, of the London Dispensatory, diluted with eight times its quantity of water, makes a very good injection.

Irritating applications are, either injections, or bougies, simple or medicated with irritating medicines. Violent exercise may be considered as having the same effect. Such applications should never be used till the other methods have been fully tried, and found unsuccessful. They at first increase the discharge. Two grains of the hydrargyrus muriatus, in eight ounces of water, are a very good irritating injection. In irritable habits, such an application may do great harm, and the capability of the parts to bear its employment, should first be made out, if possible.

Bougies sometimes act violently, and are more efficacious than injections. A simple unmedicated one is generally sufficient, and must be used a month or six weeks, before the cure can be depended upon. Those medicated with camphor, or turpentine, need not be used so long. The size of the bougie should be under the common.

Mr. Hunter has known a gleet disappear on the breaking out of two chancres on the glans. Gleets have also been cured by a blister on the under-side of the urethra; and, by electricity.

In every plan of cure, rest or quietness, is generally of great consequence; but, after the failure of the usual modes, riding on horseback has immediately effected a cure.

Regularity and moderation in diet are to be observed.

Intercourse with women often causes a return, or increase of gleet; and, in such cases, it gives suspicion of a fresh infection; but the difference between this and a fresh infection is, that here the return is almost immediately after the connexion.

Gleets in women, are cured like those of men. Turpentine, however, has no specific effect on the vagina. The astringent injections may also be stronger, than those for men.

See *A Treatise on the Venereal Disease*, by John Hunter. Also, *Swediaur's Practical Observations on Venereal Complaints*.

GLOSSOCA'TOCHUS. (from γλωσσα, the tongue; and κατεχω, to depress.) An instrument for pressing down the tongue; a spatula. The ancient glossocatichus was a sort of forceps, one of the blades of which served to depress the tongue, while the other was applied under the chin.

GLOSSOCOMION. (from γλωσσα, the tongue; and κομειω, to guard.) By this was formerly meant a case for the tongue of a hantboy; but the old surgeons, by metaphor, used the term to signify a case for a broken limb.

GOITRE. See *Bronchocoele*.

GONORRHŒA. (from γονη, the semen; and ρεω, to flow.) Etymologically, an involuntary discharge of the semen; but always, according to modern surgery, a discharge of a purulent infectious matter, from the urethra in the male, and from the vagina and surfaces of the labiæ, nymphæ, clitoris, &c. in the female subject.

This disease occurs, in Latin authors, under the different denominations of *gonorrhœa*, *G. Virulenta*, *Fluor albus malignus*. Dr. Swediaur, after censuring the etymological import, as conveying an erroneous idea, says, if a Greek name is to be retained, he would call it *blennorrhœgia*, from βλεννο, mucus, and ρεω, to flow. However, as most moderns consider the discharge as, pus, not mucus, the etymological import of *blennorrhœa* is as objectionable as that of *gonorrhœa*. In English, the disease is commonly called a *clap*, from the old French word *clapises*, which were public shops, kept and inhabited by single prostitutes, and generally confined to a particular quarter of the town, as is even now the case in several of the great towns in Italy. In German, the disorder is named a *tripper*, from dripping; and in French, a *chaudepisse*, from the heat and scalding in making water. (*Swediaur*.)

We shall first present the reader with some of Mr. Hunter's opinions, concerning the nature of gonorrhœa, its symptoms, and treatment; and, lastly, take notice of what some other writers have said.

When an irritating matter of any kind is applied to a secreting surface, it increases that secretion, and changes it from its natural state to some other. In the present instance, it is changed from mucus to pus.

Till about the year 1753, it was generally supposed, that the matter from the urethra, in a gonorrhœa, arose from ul-

cers in the passage; but it was then clearly ascertained, that pus could be secreted without a breach of substance. It was first accidentally proved, by dissection, that pus could be formed in the bag of the pleura, without ulceration; and Mr. Hunter afterwards examined the urethra of malefactors and others, who were executed, or died, while known to be affected with gonorrhœa, and demonstrated that the canal was entirely free from every appearance of ulcer.

The time, when a gonorrhœa first appears, after infection, is very various. It generally comes on sooner, than a chancre. Mr. Hunter has had reason to believe, that, in some instances, the disease has begun in a few hours, while, in others, six weeks have previously elapsed; but he has known it begin at all the intermediate periods. About six, eight, ten, or twelve days, however, after infection, is the most common period.

The surface of the urethra is subject to inflammation and suppuration, from various other causes besides the venereal poison; and sometimes discharges happen spontaneously, when no immediate cause can be assigned. Such may be called *simple gonorrhœa*, having nothing of the venereal infection in them.

Mr. Hunter has known the urethra sympathize with the cutting of a tooth, and produce all the symptoms of a gonorrhœa. This happened several times to the same patient. The urethra is known to be sometimes the seat of the gout; Mr. Hunter has known it to be the seat of rheumatism.

When a secreting surface has once received the inflammatory action, its secretions are increased and visibly altered. Also, when the irritation has produced inflammation, and an ulcer in the solid parts, a secretion of matter takes place, the intention of which, in both, seems to be to wash away the irritating matter. But, in inflammations, arising from specific, or morbid poisons, the irritation cannot be thus got rid of; for, although the first irritating matter be washed away, yet, the new matter formed has the same quality as the original had; and therefore, upon the same principle, it would produce a perpetual source of irritations, even if the venereal inflammation, like many other specific diseases, were not what it really is, kept up by the specific quality of the inflammation itself. This inflammation seems, however, to be only capable of lasting a limited time, the symptoms peculiar to it vanishing of themselves by the parts becoming less and less susceptible of irritation. The consequent venereal matter can have no

power of continuing the original irritation; otherwise there would be no end to the disease. The time, which the susceptibility of the irritation lasts, must depend upon the difference in the constitution, and not upon any difference in the poison itself.

The venereal disease only ceases spontaneously, when it attacks a secreting surface, and produces a mere secretion of pus, without ulceration.

SYMPTOMS OF GONORRHOEA.

The first symptom is generally an itching at the orifice of the urethra, sometimes extending over the whole glans. A little fulness of the lips of the urethra, the effect of inflammation, is next observable, and soon afterwards a running appears.

The itching changes into pain, more particularly at the time of voiding the urine. There is often no pain till some time after the appearance of the discharge, and other symptoms; and in many gonorrhœas, there is hardly any pain at all even when the discharge is very considerable. At other times, a great degree of soreness occurs long before any discharge appears. There is generally, at this time, a particular fulness in the penis, and more especially in the glans. The glans has also a kind of transparency, especially near the beginning of the urethra, where the skin, being distended, smooth, and red, resembles a ripe cherry. The mouth of the urethra is, in many instances, evidently excoriated. The surface of the glans itself is often in a half-excoriated state, consequently very tender; and it secretes a sort of discharge. The canal of the urethra becomes narrower, which is known by the stream of urine being smaller than common. This proceeds from the fulness of the penis in general, and from the lining of the urethra being swollen, and in a spasmodic state. The fear of the patient, while voiding his urine, also disposes the urethra to contract. The stream of urine is generally much scattered and broken, as soon as it leaves the passage. There is frequently some degree of hemorrhage from the urethra, perhaps, from the distention of the vessels, more especially when there is a chordæ, or a tendency to one. Small swellings often occur, along the lower surface of the penis, in the course of the urethra. These, Mr. Hunter suspected to be enlarged glands of the passage. They occasionally suppurate, and burst outwardly, but now and then in the urethra itself. Mr. Hunter has also suspected such tumours to be ducts, or lacunæ of the glands of the urethra distended with mucus, in consequence

of the mouth of the duct being closed, in a manner similar to what happens to the duct leading from the lachrymal sac to the nose, and so as to induce inflammation, suppuration, and ulceration. Hardness and swelling have also occurred in the situation of Cowper's glands, and ended in considerable abscesses in the perineum. The latter tumours break either internally or externally, and sometimes in both ways, so as to produce fistulæ in perinæo.

A soreness is often felt all along the under side of the penis, frequently extending as far as the anus. The pain is particularly great in erections; but the case differs from chordæ, the penis remaining straight.—Erections are frequent in most gonorrhœas, and even sometimes threaten to bring on mortification. As opium is of great service, Mr. Hunter thinks there is reason to suppose them of a spasmodic nature.

The natural slimy discharge from the glands of the urethra is first changed, from a fine transparent ropy secretion, to a watery whitish fluid; and the lubricating fluid, which the passage naturally exhales, becomes less transparent; both these secretions becoming gradually thicker, assume more and more the qualities of common pus.

The matter of gonorrhœa often changes its colour and consistence, sometimes from a white to a yellow, and often to a greenish colour. These changes depend on the increase and decrease of the inflammation, and not on the poisonous quality of the matter itself; for, any irritation on these parts, equal to that produced in a gonorrhœa, will produce the same appearances.

The discharge is produced from the membrane lining the urethra, and from the lacunæ, but, in general, only for about two or three inches* from the external orifice. Whenever Mr. Hunter had an opportunity of examining the urethra affected with gonorrhœa, he always found the lacunæ loaded with matter, and more visible than in the natural state. Before the time of this celebrated man, it was commonly supposed, that the discharge arose from the whole surface of the urethra, and even from Cowper's glands, the prostate and vesiculæ seminales.

But, if the matter were secreted from all these parts, the pus would collect in the bulb, as the semen does, and thence be emitted in jerks; for, nothing can be

* P. 50 Mr. Hunter says, seldom further than an inch and a half, or two inches at most. This he terms the specific extent of the inflammation.

in the bulbous part of the urethra, without stimulating it to action, especially, when in a state of irritation and inflammation.

When the inflammation is violent, some of the vessels of the urethra often burst, and a discharge of blood ensues. Sometimes such blood is only just enough to give the matter a tinge. The erections often stretch the part so much as to cause an extravasation.

When the inflammation goes more deeply than the membranous lining, and affects the recticular membrane of the urethra, it produces in it an extravasation of coagulable lymph, the consequence of which is a chordee. (See *Chordee*.)

Mr. Hunter suspected, that the disease is communicated or creeps along from the glans to the urethra, or, at least, from the lips of the urethra to its inner surface, as it is impossible, that the infectious matter can, during coition, get as far as the disease extends. He mentions an instance, in which a gentleman, who had not cohabited with any woman for many weeks, to all appearances caught a gonorrhœa from a piece of plaster, which had adhered to his glans penis, in a necessary abroad, and which is accounted for by supposing that some person, with a clap, had previously been to this place, and had left behind some of the discharge, and that the above gentleman had allowed his penis to remain in contact with the matter, till it had dried.

Many symptoms, depending on the sympathy of other parts with the urethra, sometimes accompany a gonorrhœa. An uneasiness, partaking of soreness and pain, and a kind of weariness, are every where felt about the pelvis. The scrotum, testicles, perinæum, anus, and hips, become disagreeably sensible to the patient, and the testicles often require being suspended. So irritable, indeed, are they in such cases, that the least accident, or even exercise, which would have no such effect at another time, will make them swell. The glands of the groin are often affected sympathetically, and even swell a little, but do not suppurate, as they generally do when they inflame from the absorption of matter. Mr. Hunter has seen the irritation of a gonorrhœa so extensive as to affect with real pain the thighs, buttocks, and abdominal muscles. He knew one gentleman, who never had a gonorrhœa without being immediately seized with universal rheumatic pains.

When the gonorrhœa, exclusive of the affections arising from sympathy, is not more violent than has been described, it may be called a *common*, or *simple venereal one*; but, if the patient is very susceptible

of such irritation, or of any other mode of action which may accompany the venereal, then the symptoms are in proportion more violent. In such circumstances, we sometimes find the irritation and inflammation exceed the specific distance, and extend through the whole urethra. There is often a considerable degree of pain in the perinæum; and a frequent, though not a constant symptom, is a spasmodic contraction of the acceleratores urinæ, and rectores muscles. The inflammation, in these cases, is sometimes considerable, and goes deeply into the cellular membrane, without producing any effect, however, except swelling. In other instances, it goes on to supuration, often becoming one of the causes of fistulæ in perinæo. Cowper's glands may hence suppurate, and the irritation is often extended even to the bladder itself.

When the bladder is affected, it becomes more susceptible of every kind of irritation. It will not bear the usual distention, and, therefore, the patient cannot retain his water the ordinary time, and the moment the desire of making water takes place, he is obliged instantly to make it, with violent pain in the bladder, and still more in the glans penis, exactly similar to what happens in a fit of the stone. If the bladder be not allowed to discharge its contents immediately, the pain becomes almost intolerable; and even when the water is evacuated, there remains, for some time, a considerable pain, both in the bladder and glans.

The ureters, and even the kidneys, sometimes, though rarely, sympathize, when the bladder is much affected. Mr. Hunter had reason to suspect, that the irritation may be communicated to the peritonæum, by means of the vas deferens.

Mr. Hunter mentions a case in which, when the inflammatory symptoms of a gonorrhœa were abating, an incontinence of urine came on; but, in time, got spontaneously well.

A very common symptom, attending a gonorrhœa, is a swelling of the testicle. See *Hernia Humoralis*.

Another occasional consequence of a gonorrhœa, is a sympathetic swelling of the inguinal glands. (See *Bubo*.)

A hard chord is sometimes observed, leading from the prepuce along the back of the penis, and often directing its course to one of the groins, and affecting the glands. There is most commonly a swelling in the prepuce, at the part where the chord takes its rise. This sometimes happens when an excoriation and a discharge from the prepuce, or glans penis exist.

From the above account, the symptoms

of gonorrhœa, in different cases, seem to be subject to infinite variety. The discharge often appears without any pain; and the coming on of the pain is not at any stated time after the appearance of the discharge. There is often no pain at all, although the discharge is in considerable quantity, and of a bad appearance. The pain often goes off, while the discharge continues, and will return again. An itching, in some cases, is felt for a considerable time, which is sometimes succeeded by pain; though, in many cases, it continues to the end of the disease. On the other hand, the pain is often troublesome, and considerable, even when there is little or no discharge. In general, the inflammation in the urethra does not extend beyond an inch or two from the orifice; sometimes it runs all along the urethra to the bladder, and even to the kidneys, and, in some cases, spreads into the substance of the urethra, producing a chordee. The glands of the urethra inflame, and often suppurate; and Mr. Hunter suspected that Cowper's glands sometimes do the same. The neighbouring parts sympathize, as the glands of the groin, the testicle, the loins, and pubes, with the upper parts of the thighs, and abdominal muscles. Sometimes the disease appears a few hours after the application of the poison; sometimes six weeks elapse first. It is often not possible to determine whether it is a venereal or only an accidental discharge, arising from some unknown cause.

GONORRHOEA IN WOMEN.

The disease is not so easily ascertained in them as in men, because they are subject to a disorder called *fluor albus*, which resembles gonorrhœa. A discharge simply from women, is less a proof of the existence of a gonorrhœa, than even a discharge without pain in men. The kind of matter does not enable us to distinguish a gonorrhœa from a *fluor albus*; for the discharge in the latter affection often puts on all the appearance of venereal matter. Pain is not necessarily present and therefore forms no line of distinction. The appearance of the parts often gives us but little information; for, continues Hunter, I have frequently examined the parts of those who confessed all the symptoms, such as increase of discharge, pain in making water, soreness in walking, or when the parts were touched, yet I could see no difference between these and sound parts. I know of no other way of judging, in cases where there are no symptoms sensible to the person herself, or where the patient

has a mind to deny any uncommon symptoms, but from the circumstances preceding the discharge; such as her having been connected with men supposed to be unsound, or her being able to give the disorder to others; which last circumstance being derived from the testimony of another person, is not always to be trusted to, for obvious reasons.

From the manner, in which the disease is contracted, it must principally attack the vagina, a part not endowed with much sensation. In many cases, however, it produces a considerable soreness on the inside of the labia, nymphæ, clitoris, caruncule myrtiliformes, and meatus urinarius. Those parts are so sore, in some cases, as not to bear being touched; the person can hardly walk; the urine gives pain in its passage through the urethra, and when it comes into contact with the above-mentioned parts.

The bladder sometimes sympathizes, and even the kidneys. The mucous glands on the inside of the labia, often swell, and sometimes suppurate, forming small abscesses, which open near the orifice of the vagina.

Mr. Hunter states, that the venereal matter from the vagina sometimes runs down the perinæum to the anus, and produces a gonorrhœa, or chancre, in that situation. The disease in women may probably wear itself out, as in men; but it may exist in the vagina for years, if the testimony of patients can be relied on.

TREATMENT OF GONORRHOEA.

As every form of the venereal disease arises from the same cause, and as we have a specific for some forms, we might expect that this would be a certain cure for every one; and, therefore, that it must be no difficult task to cure the disease, when in the form of inflammation and suppuration in the urethra. Experience, however, teaches us, that the gonorrhœa is the most variable in its symptoms, while under a cure; and the most uncertain, with respect to its cure, of any forms of the venereal disease; many cases terminating in a week, while others continue for months, under the same treatment.

The only curative object is, to destroy the disposition and specific mode of action of the solids of the parts, and as they become changed, the poisonous quality of the matter produced will also be destroyed. This effects the cure of the disease, but not always of the consequences.

This form of the disease is not capable of being continued beyond a certain time in any constitution; and when it is vio-

lent, or of long duration, it is owing to the part being very susceptible of such irritation, and readily retaining it. As we have no specific remedy for the gonorrhœa, it is fortunate that time alone will effect a cure. It is worthy of consideration, however, whether medicine can be of any service. Mr. Hunter is inclined not to think it of the least use, perhaps, once in ten cases. But even this would be of some consequence, if the cases capable of being benefited could be distinguished.

The means of cure, generally adopted, are of two kinds, internal remedies, and local applications; but, whatever plan is pursued, we are always to attend more to the nature of the constitution, or to any attending disease in the parts themselves, or parts connected with them, than to the gonorrhœa itself.

When the symptoms are violent, but of the common inflammatory kind, known from the extent of the inflammation not exceeding the specific distance, the local treatment may be either irritating or soothing.

Irritating applications, in these cases, are less dangerous, than when there exists irritable inflammation, and they may alter the specific action; but, to produce this effect, their irritation must be greater, than that of the original injury. The parts will afterwards recover of themselves, as from any other common inflammation.

Mr. Hunter believes, however, that the soothing plan is the best at the beginning. If the inflammation be great, and of the irritable kind, no violence is to be used, for it would only increase the symptoms; nothing should be done that may tend to stop the discharge, as doing so would not put a stop to the inflammation. The constitution is to be altered, if possible, by remedies adapted to each disposition, with a view of altering the actions of the parts arising from such disposition, and reducing the disease to its simple form. If the constitution cannot be altered, nothing is to be done, and the action is to be allowed to wear itself out.

When the inflammation has abated, the cure may be attempted by internal remedies, or local applications, not operating violently, which might re-produce the irritation. Gentle astringents may be applied.

But, if the disease has begun mildly, an irritating injection may be used, in order quickly to get rid of the specific mode of action. This application will increase the symptoms for a time; but, when it is left off, they will often abate, or wholly disappear. In such a state of

parts, astringents may be used, the discharge being now the only thing to be removed.

When itching, pain, and other uncommon sensations are felt for some time before the discharge appears, Mr. Hunter diffidently expresses his inclination to recommend the soothing plan, instead of the irritating one, in order to bring on the discharge, which is a step towards the resolution of the irritation; and he adds, that to use astringents would be bad practice, as, by retarding the discharge, they would protract the cure. When there are strictures, or swelled testicles, astringents should not be used; for, while there is a discharge, such complaints are relieved.

Mr. Hunter thus expresses himself in regard to the effect of mercury in gonorrhœa: "I doubt very much of mercury having any specific virtue in this species of the disease; for I find that it is as soon cured without mercury as with it, &c. So little effect, indeed, has this medicine upon a gonorrhœa, that I have known a gonorrhœa, take place while (the patient was) under a course of mercury, sufficient for the cure of a chancre. Men have also been known to contract a gonorrhœa when loaded with mercury for the cure of a lues venerea; the gonorrhœa, nevertheless, has been as difficult of cure as in ordinary cases."

Mr. Hunter does not say much in favour of cracants, diuretics, and astringents, given internally. He allows, however, that astringents which act specifically on the parts, as the balsams, conjoined with any other medicine, which may be thought right, may help to lessen the discharge, in proportion as the inflammation abates.

Local applications may be either internal to the urethra, external to the penis, or both. Those which are applied to the urethra seem to promise most efficacy, because they come into immediate contact with the diseased parts. They may be either in a solid or fluid form. A fluid is only a very temporary application. The solid ones, or bougies, may remain a long while, but in general irritate immediately, from their solidity alone; and, Mr. Hunter says, the less bougies are used, when the parts are in an inflamed state, the better, though he never saw any bad effects from them, when applied with caution.

The fluid applications, or injections, in use, are innumerable; and as gonorrhœas frequently get well with so many of various kinds, we may infer, that such complaints would, in time, get well of themselves. Injections, however, certainly

often have an immediate effect on the symptoms, and hence must have power; though the one which possesses the greatest specific power is unknown. As injections are only temporary applications, they must be used often, especially when found useful, and they are not of an irritating kind.

Mr. Hunter divides injections into four kinds, the *irritating*, *sedative*, *emollient*, and *astringent*.

Irritating injections, of whatever kind, act in this disease upon the same principle; that is, by producing an irritation of another kind, which ought to be greater than the venereal; by which means the venereal is destroyed and lost, and the disease cured, although the pain and discharge may still be kept up by the injection. Those effects, however, will soon go off, when the injection is laid aside. In this way bougies also perform a cure. Most of the irritating injections have an astringent effect, and prove simply astringent when mild.

Irritating injections should never be used when there is already much inflammation; especially, in constitutions, which are known to be incapable of bearing much irritation; nor should they be used when the inflammation has spread beyond the specific distance; nor when the testicles are tender; nor when, upon the discharge ceasing quickly, these parts have become sore; nor when the perinæum is very susceptible of inflammation, and especially if it formerly should have suppurated; nor when there is a tendency in the bladder to irritation, known by the frequency of making water.

In mild cases, and in constitutions which are not irritable, such injections often succeed, and remove the disease almost immediately. The practice, however, ought to be attempted with caution, and not, perhaps, till milder methods have failed. Two grains of the hydrargyrus muriatus, dissolved in eight ounces of distilled water, form a very good irritating injection; but, an injection of only half this strength may be used, when it is not intended to attempt a cure so quickly. If however, the injection, even in that proportion, gives considerable pain in its application, or occasions a great increase of pain in making water, it should be diluted.

Sedative injections will always be of service, when the inflammation is considerable, and they are very useful in relieving the pain. Perhaps, the best sedative is opium, as well when given by the mouth, or anus, as when applied to the part affected, in the form of an injection. But, even opium will not act as a

sedative in all constitutions, and parts; but, on the contrary, often has opposite effects, producing great irritability. Lead may be reckoned a sedative, so far as it abates inflammation, while, at the same time, it may act as a gentle astringent. Fourteen grains of saccharum saturni, in ℥viij of distilled water, make a good sedative astringent injection.

Drinking freely of diluting liquors may, perhaps, have a sedative effect, as it in part removes some of the causes of irritation, by rendering the urine less stimulating to the bladder, when the irritation is there, and to the urethra in its passage through it. Diluting drinks may possibly lessen the susceptibility of irritation. The vegetable mucilages of certain seeds and plants, and the emollient gums are recommended. Mr. Hunter does not entertain much opinion of their efficacy, though some of his patients told him they experienced less uneasiness in making water, when their drink was impregnated with mucilaginous substances.

Emollient injections are the most proper, when the inflammation is very great; and they probably act by first simply washing away the matter, and then leaving a soft application to the part, so as to be singularly serviceable, by lessening the irritating effects of the urine. Indeed, practice proves this; for a solution of gum-arabic, milk and water, or sweet oil, will often lessen the pain, and other symptoms, when the more active injections have done nothing, or seemed to do harm.

The irritation at the orifice of the urethra, is frequently so great, that the point of the syringe cannot be suffered to enter. In this case, no injection should be used till the inflammation has abated; but, in the mean while, fomentation may be employed.

Astringent injections act by lessening the discharge. They should only be used towards the latter end of the disease, when it has become mild. But, if the disease should begin mildly, they may be used at the very beginning; for, by gradually lessening the discharge, without increasing the inflammation, we complete the cure, and prevent a continuance of the discharge called *gleet*. They will have an irritating quality, if used strong, and hence increase the discharge, instead of lessening it. Mr. Hunter's experience did not teach him, that one astringent was much better than another. The astringent gums, as dragon's blood, the balsams, and the turpentine, dissolved in water; the juices of many vegetables, as oak, bark, Peruvian bark, tormentil root, and, perhaps, all the metallic salts,

as green, blue, and white vitriols; the salts of mercury, and also alum; probably all act much in the same way; though the mere changing of an injection is often efficacious. The external applications are poultices, and fomentations, which can only be useful when the prepuce, glans, and orifice of the urethra are inflamed.

Since Mr. Hunter's time, many surgeons have been in the habit of keeping the penis, in the incipient inflammatory stage of gonorrhœa, covered with linen, kept continually wet with the saturnine lotion; a practice which is certainly both rational and beneficial. Mr. Abernethy, in his *Lectures on Surgery*, speaks in favour of this method.

When the glands of the urethra are enlarged, mercurial ointment may be rubbed on the part; and this will probably be of more service after the inflammation has subsided.

TREATMENT OF GONORRHOEA IN WOMEN.

This is nearly the same as that of the disease in men, but is more simple. When the disorder is in the vagina, injections are best; and after them, the parts may be smeared with mercurial ointment, and the external parts washed with the injection. It is almost impossible for the patient to throw an injection into the urethra, when it is affected. The same injections are proper as for men; but they may be made doubly strong. When the glands of the vagina are enlarged, mercurial ointment should be freely applied; and when they form abscesses, these should be opened, and dressed.

CONSTITUTIONAL TREATMENT OF GONORRHOEA.

In many strong plethoric constitutions, the symptoms are violent, and there is a great tendency to inflammatory fever. In such instances, opiate clysters, though at first productive of relief, sometimes occasion in the end fever, and consequently aggravate all the symptoms. The balsam capivi, sometimes, in such cases, increases the inflammatory symptoms. The treatment of this kind of constitution, consists chiefly in evacuations, the best of which are bleeding and gentle purging. To live sparingly, and, above all, to use little exercise, is necessary.

In the weak and irritable constitution, the symptoms are frequently very violent, the inflammation extending beyond the specific distance, running along the urethra, and even affecting the bladder. The indication, in this instance, is to strength-

en; and bark alone has been known to effect a cure. All evacuations are hurtful.

The fever has been known to stop the discharge, relieve the pain in making water, and finally cure the disease. On other occasions, Mr. Hunter has seen all the symptoms of gonorrhœa cease on the accession of a fever, and return when the fever was subdued. In other examples, a gonorrhœa mild at first, has been rendered severe by the coming on of a fever, and, on this ceasing, the gonorrhœa has ceased. Although a fever does not always cure a gonorrhœa, yet, as it may do so, nothing should be done while it lasts. If the local complaint should continue after the fever is gone, it is to be treated according to symptoms.

A gonorrhœa may be considerably affected by the patient's manner of living, and by other diseases attacking the constitution. Most things which hurry or increase the circulation, aggravate the symptoms; such as violent exercise, drinking strong liquors, eating strong indigestible food, some kinds of which act specifically on these parts, so as to increase the symptoms more than simply heating the body would do; such as peppers, spices, and spirits.

In cases which have begun mildly, in which the inflammation is only slight, or in others, in which the violent symptoms have subsided, such medicines as have a tendency to lessen the discharge, may be given, together with the local remedies before mentioned. Turpentine is the most efficacious. Cantharides, the salts of lead and copper, and alum, have also been recommended.

Mr. Hunter advises small doses of mercury, in consequence of the possibility of absorption, and with a view of preventing lues venerea.

TREATMENT OF OCCASIONAL SYMPTOMS OF GONORRHOEA.

Bleeding from the urethra is sometimes relieved by the balsam capivi. Mr. Hunter did not find astringent injections of use.

Painful erections are greatly prevented by taking twenty drops of tinctura opii at bed-time. Cicuta has also some power in this way.

Chordee. See this word.

Bladder affected. Opiate clysters, the warm bath, and bleeding, if the patient is of full habit, are proper. Leeches may be applied to the perinæum. When this affection lasts a considerable time, and is not mitigated by common methods, Mr. Hunter advises trying an opiate

plaster on the pubes, or the loins, where the nerves of the bladder originate; or a small blister on the perinæum. In another place, he mentions bark, cicuta, sea air, and sea bathing, among the proper means.

Swelled testicles. See *Hernia Humoralis*.

For a more full account of Gonorrhœa, according to the above doctrines, see a *Treatise on the Venereal Disease*, by John Hunter, from page 29 to 90.

ON THE QUESTION, WHETHER GONORRHŒA IS REALLY A FORM OF THE VENEREAL DISEASE?

The foregoing remarks, and other ones in Mr. Hunter's work, would lead one to believe, that the poison of gonorrhœa and the venereal virus are the same. Here it is our duty impartially to state the arguments, which have been urged for, and against, this important doctrine.

Mr. Hunter assures us, that he has seen all the symptoms of lues venereal originating from gonorrhœa only; that he had even produced venereal chancres by inoculating with the matter of gonorrhœa; and that he afterwards repeated these experiments in a manner in which he could not be deceived. P. 293, & seq.

Mr. Hunter's experiments, it is true, have been repeated with a different result; but, as an eminent modern writer remarks, can we wonder at this, when we consider from how many causes gonorrhœa may arise, and how impossible it is to distinguish the venereal from any other? (*Observations on Morbid Poisons*, by J. Adams, M. D. p. 91. edit. 2.)

Another argument adduced by Hunter, in favour of the poisons of gonorrhœa and chancre being the same, is the probability, that the Otaheitians had the venereal disease propagated to them by European sailors, who were affected with gonorrhœa; for these can hardly be supposed to have had a chancre, during a voyage of five months, without the penis being destroyed.

It is impossible, however, to say what time may elapse, between the application of venereal poison to the penis, and the commencement of ulceration. Therefore, Bougainville's sailors, alluded to by Mr. Hunter, might have contracted the infection at Rio-de-la-Plata; but actual ulcers on the penis might not have formed till about five months afterwards, when the ship arrived at Otaheite.

In attempting to explain why a gonorrhœa and a chancre do not equally produce lues venerea, and why the medicine which almost universally cures chancre, has less effect on gonorrhœa, a modern

advocate for Mr. Hunter's doctrine says, that we must take into consideration, that the seat of the two diseases is different; that the same cause may produce different effects upon different parts; that the same poison, when mixed with different fluids, may be more or less violent in its operation; and that there may be greater or less attraction of certain fluids to a part, according to its nature and composition. (*Inquiry into some Effects of the Venereal Poison* by S. Sawrey, 1802, p. 4.) Mr. Sawrey very truly remarks, p. 6, that if gonorrhœal matter has clearly and decidedly produced chancre, or contaminated the system in any one instance, the question is determined. It could in no instance produce these effects, unless it had the power of doing so. This writer brings forward some cases to shew, that the poison of gonorrhœa may produce gonorrhœa, or chancre; but, the limits of this work only afford room to observe, that these instances are by no means decisive of the point, as some objections may be urged against them, as indeed, Mr. Sawrey himself allows. That Mr. Hunter's cases are inconclusive, I have endeavoured to explain in the *First Lines of the Practice of Surgery*, to which I must refer my readers.

Why does not gonorrhœa commonly produce ulceration in the urethra? Mr. Sawrey tries to solve this question, by saying, that the product of the venereal inflammation, the diseased contents of the small arteries of the urethra, are thrown out of these open-mouthed vessels into this canal, without any breach in their texture, which otherwise would be a necessary consequence.

Why does not gonorrhœa equally contaminate the system as chancre? In gonorrhœa, says Mr. Sawrey, the discharge is very plentiful; it is not, in general, attended with ulceration; the poison is much more diluted, and mixed with a mucous and puriform fluid. It is deposited in the urethra, and its lacunæ, where little or no pressure is applied, and it finds easy egress out of the canal. In chancre there is breach of substance, the poison is not much diluted, &c.

Why does not chancre generally, in the same person, produce gonorrhœa, and gonorrhœa chancre? Mr. Sawrey, in answer expresses his belief, that these incidents are not very unfrequent. He says, he has known persons having a chancre, which continued for months, become affected, after that time, with a clap, without any further exposure. His opinion is, that the matter of the chancre had insinuated itself into the urethra, and produced the disease; though, he

confesses, many would explain the circumstance, by supposing that the chancre and gonorrhœa were both communicated at the same time by two different poisons.

Mr. Hunter remarks, that the presence of one disease renders the adjacent parts less susceptible of its influence.

Mr. Sawrey concludes his second chap. with inclining to the idea, that the matter of gonorrhœa is not strictly pus, but of a more mucous nature than that of a chancre. However, when he mentions chemical attractions, as drawing the poison from mucus to the urethra, and from pus to the dry parts, in order to explain the last of the above questions, every sober reader must feel sorry, that a work, which contains some really sensible observations, should comprehend this most unfortunate one.

Mr. Whately has also written, in support of the opinion, that the matter of gonorrhœa and that of chancre, are the same. (See *Whately on Gonorrhœa Virulenta*.)

Another defender of this side of the question is Dr. Swediaur, who endeavours to prove the fallacy of the following positions: 1. *That the poison which produces the clap, does never, like that of chancres, produce any venereal symptoms in the mass or lues itself.* 2. *That the poison of the clap never produces chancres and that the poison of chancres never produces a clap.* 3. *That mercury never contributes to, nor accelerates the cure of a clap; but, that, on the contrary, every blennorrhagia may be certainly cured without mercury, and without any danger of leaving a lues behind.*

His arguments run thus;—the reason why claps do not, like chancres, constantly produce the lues, is, that most of them excite only a superficial inflammation in the membrane of the urethra, without any ulceration. Hence absorption cannot easily take place, the poison being out of the course of the circulation. But he has seen claps, with an ulcer in the urethra, followed by the most unequivocal symptoms of lues itself. He mentions the urethra being denuded with a large quantity of mucus, as the thing impeding the common formation of ulcers, which do occasionally occur when the mucus is not secreted as usual, or is washed away. He asserts, that in many cases, where he had occasion to examine both parties, he was convinced that chancres were communicated by a person affected with a simple gonorrhœa; and *vice versa*, that a virulent clap had been the consequence of an infection from a person having merely chancres. He says, that if a patient, with a venereal running, does not take care to keep the prepuce and glans

perfectly clean, chancres will very often be produced. He owns a great many claps are cured without mercury: yet, repeated experience has shewn him, a cure cannot always be thus accomplished. Mild cases, without ulcer or excoriation in the urethra, may certainly be radically cured without a grain of mercury; and though mercury should be given, it would not have the least effect: not because the disease does not proceed from a venereal poison, but because out of the course of the circulation. He contends, that the topical use of mercury in injections, acts usefully even in these cases. But, when a clap is joined with ulceration in the urethra, it is always cured more safely and expeditiously with mercury, and is frequently incurable without it. A lues also follows cases attended with ulcers in the urethra. He allows that all claps are not venereal. (See *Practical Observations on Venereal Complaints*, by J. Swediaur.)

One argument urged against the identity of gonorrhœal and chancreous virus, is, that gonorrhœa was not described as a symptom, till nearly half a century after the other symptoms of the venereal disease were known. Fallopius is among the first who observed gonorrhœa, as a symptom of the venereal disease. "If, however," says Dr. Adams, "venereal gonorrhœa was unnoticed till about fifty years after the other forms of the disease were described, what does this prove, but that contagious gonorrhœa was so common, as to be disregarded as a symptom of the new complaint? Can there be a doubt, from the caution given by Moses, that gonorrhœa was considered as contagious in his days? During the classical age, we find inconveniences of the urinary passages, were imputed to incontinence; and the police of several states, before the siege of Naples, made laws for preserving the health of such as would content themselves with public stews, instead of disturbing the peace of families. This is enough to lessen our surprise, that gonorrhœa should be unnoticed for some time after the appearance of the venereal disease. But, so far is it from proving the two contagions are different, that the fairest inference we can draw is in favour of their identity. For, if by this time the venereal disease began to be so far understood, that secondary symptoms were found the consequence of primary ones in the genitals, it is most probable that the first suspicion of venereal gonorrhœa arose from the occurrence of such secondary appearances, where no other primary symptoms could be traced." (*Adams on Morbid Poisons*, p. 95, Edit. 2.)

In relating the arguments maintained by the best modern writers, to repel the attacks made on the doctrine, that gonorrhœa and chancre arise from the same poison, we have been compelled to disclose the chief grounds, on which the assailants venture to entertain a contrary theory.

Mr. B. Bell is the principal author who has written against the opinions maintained by Hunter, Sawrey, Swediaur, Adams, &c. Our limits will only allow us just to enumerate a few of his leading arguments.

If the matter of gonorrhœa, and that of chancre, were of the same nature, we must admit that a person with a chancre only, can communicate to another, not only every symptom of pox, but of gonorrhœa; and that another, with gonorrhœa only, can give to all, with whom he may have connexion, chancres, with their various consequences. This ought, indeed, to be a very frequent occurrence; whereas, all allow that it is even in appearance very rare.

On the supposition of the matter of gonorrhœa and lues venerea being the same, the latter ought to be a much more frequent occurrence than the former, from the greater ease with which the matter of infection must, in every instance, be applied to those parts on which it can produce chancres, than to the urethra, where, instead of chancre or ulceration, it almost always excites gonorrhœa. It is difficult to conceive how the matter, by which the disease is communicated, should find access into the urethra; while all the external parts of the penis, particularly the glans, must be easily and universally exposed to it; and yet gonorrhœa is a much more frequent disease than pox. Cases of gonorrhœa are in proportion to those of chancre, according to Mr. B. Bell's experience, as three to one. It is obvious that the very reverse should happen, if the two diseases were produced by the same kind of matter.

I need not adduce other arguments, as the reader must be already acquainted with any worth knowing, from what is said in the previous part of the present article.

The grand practical consideration, depending on the possibility of the venereal disease arising from gonorrhœa, is, whether mercurials should not be exhibited, in all cases, with a view of preventing such a consequence.

Waving, on my own part, all attempts to decide the point, whether the matter of a chancre, and that of gonorrhœa, are of the same nature, I shall merely content myself with stating, that as far as my ob-

servation and enquiries extend, the majority of the best practitioners of the present day consider the exhibition of mercury unnecessary, and consequently, improper in cases of gonorrhœa. This fact almost amounts to a proof, that if venereal symptoms do ever follow a clap, they are so excessively rare, and, I may add, always so imputable to other causes, that the employment of mercury, as a prevention, would, upon the whole, do more injury than benefit to mankind; and this even admitting (what, in my mind, has never been unequivocally proved) that the matter of gonorrhœa is really capable, in a very few instances, of giving rise to the venereal disease.

The reader must weigh the different arguments himself. Some of Mr. B. Bell's reasoning is certainly untenable, as Sawrey has clearly shewn; but the latter, also, is not invulnerable in many points, which he strives to defend.

The reader is referred, for further information, to *A Treatise on the Venereal Disease*, by John Hunter; 1788. *Whately on the Gonorrhœa Virulenta*; 1801. *Practical Observations on Venereal Complaints*, by F. Swediaur, M. D. edit. 3. *An Enquiry into some of the Effects of the Venereal Poison*, by S. Sawrey; 1802. *Observations on Morbid Poisons*, by J. Adams, M. D. edit. 2. 1807.

GORGET. An instrument used in the operation of lithotomy, for the purpose of cutting the prostate gland and neck of the bladder, so as to enable the operator to introduce the forceps and extract the stone. It is, in fact, a sort of knife, at the end of which is a beak, that fits the groove of the staff, and admits of being pushed along it into the bladder.

Besides cutting gorgets, constructed for the preceding design, there are also blunt ones, intended to be introduced into the wound, when their concavity serves as a guide for the forceps into the bladder.

GRANULATIONS. (from *granum*, a grain.) The little grain-like, fleshy bodies, which form on the surfaces of ulcers, and suppurating wounds, and serve both for filling up the cavities, and bringing nearer together and uniting their sides.

Nature, in bringing parts as nearly as possible to their original state, whose disposition, action, and structure have been altered by accident, or disease; and after having, in her operations for this purpose, formed pus, she immediately sets about forming new matter, upon surfaces in which there has been a breach of continuity. This process is called *granulating*, or *incarnation*; and the substance formed is called *granulations*.

Granulations are an accretion of ani-

mal matter upon the wounded, or exposed surface; they are formed by an exudation of the coagulating lymph from the vessels; into which new substance, both the old vessels very probably extend, and in which new ones are formed. Hence granulations are very vascular; indeed, more so than almost any other animal substance. The vessels in granulations pass from the original parts to their basis, and thence towards their external surface, in tolerably regular parallel lines. The surface of this new substance has the same disposition to secrete pus, as the parts which produced it. The surfaces of granulations are very convex, the reverse of ulceration, having a great many small points, or eminences, so as to appear rough. The smaller such points are, the more healthy the granulations. The colour of healthy granulations is a deep florid red. When livid, they are unhealthy, and have only a languid circulation. Healthy granulations, on an exposed or flat surface, rise nearly even with the surface of the surrounding skin, and often a little higher; but, when they exceed this, and take on a growing disposition, they are unhealthy, become soft, spongy, and without any disposition to form skin. Healthy granulations are always prone to unite to each other, so as to be the means of uniting parts.

Granulations are not easily formed on the side of an abscess, nearest the surface of the body.

They are not endowed with the same powers as parts originally formed. Hence they more readily ulcerate, and mortify. The curious mode in which granulations contract, when sores are healing, and even for some time after they are healed, we have explained in the article *Cicatrizatio*n. (See *A Treatise on the Blood, Inflammation, &c.* by John Hunter. p. 473, et seq. 1794.)

GUAIAUCUM. (from an Indian word.) Many writers of the sixteenth century, contended that guaiacum was a true specific for the venereal disease; and the celebrated Boerhaave, in the eighteenth, maintained the same opinion. Mr. Pearson mentions, that when he was first entrusted with the care of the Lock Hospital, in 1781, Mr. Bromfield and Mr. Williams were in the habit of reposing great confidence in the efficacy of decoction of guaiacum wood. This was administered to such patients as had already employed the usual quantity of mercury; but who complained of nocturnal pains, or had gummata, nodes, ozæna, and such other effects of the venereal virus, connected with secondary symptoms, as did not yield to a course of mercurial frictions. The diet consisted of raisins, and

hard biscuit; from two to four pints of the decoction were taken every day; the hot bath was used twice a week; and a dose of antimonial wine and laudanum, or Dover's powder, was commonly taken every evening. Constant confinement to bed was not deemed necessary; neither was exposure to the vapour of burning spirit, with a view of exciting perspiration, often practised; as only a moist state of the skin was desired. This treatment was, sometimes, of singular advantage to those whose health had sustained injury from the disease, long confinement, and mercury. The strength increased; bad ulcers healed; exfoliations were completed; and these anomalous symptoms, which would have been exasperated by mercury, soon yielded to guaiacum.

Besides such cases, in which the good effects of guaiacum caused it to be erroneously regarded, as a specific for the lues venerea, the medicine was also formerly given, by some on the first attack of the venereal disease. The disorder being thus benefited, a radical cure was considered to be accomplished; and, though frequent relapses followed, yet, as these partly yielded to the same remedy, its reputation was still kept up. Many diseases, also, which got well, were probably not really venereal cases. Mr. Pearson seems to allow, that, in syphilitic affections, it may, indeed, operate like a true antidote, suspending, for a time, the progress of certain venereal symptoms, and removing other appearances altogether; but, he observes, that experience has evinced, that the unsubdued virus yet remains active in the constitution.

Mr. Pearson has found guaiacum of little use in pains of the bones, except when it proved sudorific; but, that it was then inferior to antimony, or volatile alkali. When the constitution has been impaired by mercury, and long confinement, a thickened state of the ligaments, or periosteum, or foul ulcers, still remaining, Mr. Pearson says, these effects will often subside, during the exhibition of the decoction. He says, it will often suspend, for a short time, the progress of certain secondary symptoms of the lues venerea; for instance, ulcers of the tonsils, venereal eruptions, and even nodes. Mr. Pearson, however, never knew one instance in which guaiacum eradicated the virus; and he contends, that, its being conjoined with mercury, neither increases the virtue of this mineral, lessens its bad effects, nor diminishes the necessity of giving a certain quantity of it. Mr. Pearson remarks, that he has seen guaiacum produce good effects in many patients having cutaneous diseases, the ozæna, and

scrofulous affections of the membranes and ligaments. (See *Pearson on the Effects of Various Articles in the Cure of Lues Venerea*, edit. 2. 1807.

GUMMA, a soft tumour, so named from the resemblance of its contents to gums.

GUN-SHOT WOUNDS receive their name from the manner, in which they are produced, being generally caused by hard, obtuse, metallic bodies; projected from cannons, muskets, or some other species of firearm. With such injuries, it is also usual to comprehend a variety of dreadful accidents arising from the explosion of shells, or the violence, with which pieces of stones from ramparts, or splinters of wood on board of ship, are driven about. Gunshot wounds are the most considerable of the contused kind; and what is to be said of them, will apply, more or less, to all contused wounds, according to the degree of contusion. They are particularly characterized by, what the French surgeons are fond of calling, a *disorganization* of their surface. The excessive contusion, or rather comminution, observable in gunshot wounds, depends upon the rapidity, with which the bodies, occasioning them, are propelled. The parts, touched by the ball, are converted into a blackish slough, the colour of which made our ancestors suppose, that bodies, projected by gunpowder, became heated, and actually burnt the flesh, with which they came into contact. But reason and experience have now proved, that whatever may be the rapidity of a projectile, it never acquires in its passage any perceptible heat. Indeed, a modern writer asserts, that such a degree of heat as would be requisite to make a ball burn partly in its passage, would really melt it. (*Richerand, Nosographie Chirurgicale*, Tom. 1, p. 217, edit. 2.) In general, gunshot wounds do not bleed, unless very large blood-vessels were injured; their circumference is often livid; and the shock, that attends their infliction, is particularly apt to occasion in the limb, or part, a kind of torpor, which, in many instances, extends itself to the whole system.

Until Ambroise Paré introduced more correct theories upon the subject, ideas, the most false, and errors, highly prejudicial, prevailed both in the history and treatment of gunshot wounds. Cannon-balls and bullets sometimes produce most dreadful injury, without occasioning any breach of continuity in the integuments. This observation is so strictly true, that the muscles and bones may actually be crushed and broken to atoms, without the skin being at all wounded. Such cases were for a long while imputed to the violent motion, supposed to be commu-

nicated to the air by the ball itself. It was imagined, that this elastic fluid, being rapidly displaced by the shock of the projectile, was capable of making such pressure on surrounding bodies, as to destroy their texture. But how could this violent pressure originate in the midst of the open and unbounded air? If this theory were true, the effect in question would constantly happen, whenever a ball passes near any part of the body. The contrary, however, is so much the case, that pieces of soldiers' and seamen's hats, feathers, clothes, and even of their hair, are shot away in every battle, without any other mischief being done.

In consequence of the manner, in which such injuries of the soft parts and even of the bones, unattended with any breach in the skin, have been supposed to be produced, they have been erroneously termed *wind-contusions*. In fact, these cases are now universally acknowledged by all the most accurate observers, never to proceed from the cause, to which formerly they were always ascribed.

The air does not move with the same rapidity as the ball; but its motion is less in proportion as it is a more subtle matter, and must be too feeble to account for such a violent degree of injury. The air, to which the ball must really communicate the greatest motion, is what is directly before it; and this never bruises the part untouched by the ball itself. It is only the air situated laterally to the shot, that is imagined to do injury, and it cannot be greatly agitated. The violent consequences of sudden explosions, and the effects produced on the organs of hearing, by strong commotions of the air, prove nothing relative to the point in question. Lastly, experience does not confirm the reality of such wind-contusions, for cannon-balls often tear off whole members, without the adjacent parts being in the least injured. (See *Le Vacher, in Mémoires de l'Académie de Chirurgie*, tom. 4. p. 22.)

Neither can this kind of accident be attributed to an electrical shock on the parts, in consequence of the ball being rendered electrical by friction in the calibre of the gun, and giving off the electricity as it passes by. (Vide *Plenk's Sammlungen*, 1 Theil. p. 99.) Metals never acquire this property from friction.

The mischief, imputed to the air, is occasioned by the ball itself. Its producing a violent contusion, without tearing the skin, and entering the limb, is to be ascribed to the oblique direction in which it strikes the part, or, in other instances, to the feebleness, with which the ball strikes

the surface of the body, in consequence of its having lost the greater part of its momentum, and acting principally by its weight, being, in short, what is called a spent ball. Daily observation evinces, that balls, which obliquely strike a surface, do not penetrate, but are reflected; though they may be impelled with the greatest force, and the body struck may be as soft and yielding as water. This alteration in the course of the ball, not only happens on the surface of the human body, but also in the substance of a limb which it has entered. A bone, a tendon, &c. may change the direction of a ball which touches them at all obliquely. Hence it is manifest how it happens, that the track of a gun-shot wound is not always straight, and how balls sometimes run under the integuments nearly all round the body, or a limb.

The causes of several of the peculiarities attending gun-shot wounds, as Mr. Chevalier has observed, are to be sought among the laws, by which moving bodies are governed, and by which, the mechanical effect of a ball, propelled against any part of the body, must therefore be determined. The form, the momentum, and the direction of the shot, that is received; the position, and the variety of structure, or, in other words, the variety of density and powers of resistance, in the part receiving it, must always be considered, in order to account satisfactorily for the effects, which it produces.

The first law, to which this gentleman begs the attention of his reader is, that a body in motion, striking against any substance, will communicate a part of its momentum to the substance, against which it strikes; and that this communication will be in a direct ratio to the powers of resistance, which that substance possesses at the time; whether such power of resistance be derived from its own density, or bulk, or force of cohesion, or momentum acting in a different direction. Hence, if the resistance be equal, or superior to the momentum, the motion will be stopped; the momentum, in this case, being equally divided between the body impelled and the body resisting. If the resistance be inferior, the motion will only be lessened; and if, besides being inferior, and therefore incapable of stopping the moving body, it also operates in a different direction, the future line of motion will likewise be changed, and fly off from the point, at which it meets with resistance, in a line, which will form an angle with that of the original direction, in which it moved.

Mr. Chevalier next reminds his reader, that the resistance, made by any substance

to the motion of another, will be greater, or less, *ceteris paribus*, as the angle of incidence approaches to, or recedes from a right angle; and, if it be reflected, and the motion be continued in the same medium, the angle of reflection will always be equal to the angle of incidence.

The resistance, made to a moving body, by the density of any medium, in which it moves, will be, *ceteris paribus*, as the surface of the moving body presented to that medium.

A dense medium forms a continued resistance to a body propelled with any given velocity; and, therefore, the more dense the medium, the greater the resistance, and the sooner the original momentum will be overcome by it.

A shot, moving through any medium of uniform density, will also be acted on by the attraction of gravitation, so as to be continually changing the direction in which it moves; and, if it move in vacuo, or in air, it will describe the curve called a parabola. The commencement of this curve does not take place at the point, at which the gunpowder explodes; for, within the barrel, and to some distance beyond it, the shot moves forward in a right line, called the *line of the impulse of fire*, (*Helsham's Lect. 2, p. 187;*) which line will extend farthest horizontally, the less the angle of elevation of the piece recedes from an horizontal line.

The less of the original impulse is left in a shot still moving, the more liable will it be to be stopped, or turned out of its course, by any given resistance.

Every new resistance, which a shot in motion meets with, as Mr. Chevalier has remarked, will operate so as to produce not only a diminution of its momentum, but, also, a change in its direction; every fresh resistance being in fact equivalent to a fresh power, acting in a different line from that, in which the shot was previously moving.

As a body, acted on at once by two powers, will not move in the direction of either, but, in the diagonal of a parallelogram, of which two sides are formed by the direction and momentum, given by each of those powers respectively; so every change of impulse, or resistance, will cause the body to move in so many changes of direction, till at length its momentum is overcome, and it becomes quiescent.

A continued resistance from a dense medium will be a continued application of a power, the uniform and equal operation of which will cause the motion to be curvilinear, the reason of which is sufficiently explained by writers on projectiles.

Mr. Chevalier next proceeds to explain,

that a shot, or other hard body, falling upon a soft one, as, for example, an adipose membrane, or muscle, and stopping there, or lodging in it, still acts in conformity to the same general laws, and stops only from the resistance it meets with. If this resistance is made only by the force of cohesion in the adipose membrane, or muscle, so much of that cohesion is overcome, as was equal to the momentum of the shot, when it impinged against it; and, therefore, so far, and only so far, is its substance broken through or destroyed.

It is only on such principles, that we can explain the intricate and varied course and effect of balls in parts of diversified structure, consisting of substances differing in density and powers of resistance. And, though, says Mr. Chevalier, in many cases, a mathematical explication of the course of a ball cannot be given; this arises entirely from the want of data, the laws of matter being fixed and immutable. But, when the data are known, as, for instance, the velocity and direction of the shot, the position of the patient, or of the wounded part at the time of the accident, and the structure of the parts penetrated, a much more probable conjecture of the course of the ball may generally be formed, than if these circumstances had not been regarded.

From the foregoing account, as Mr. Chevalier further notices, we may see the reason of the concussion, or shock, which is given, in many instances, to the whole system by gun-shot wounds, and which is represented by the best writers on this subject, to be often attended with grave and even alarming effects, extending not only over the injured part, but affecting the system at large. For, as the resistance to the shot is afforded not only by the texture of the injured part, but, also, in some degree, by the connexion, which this has with other parts, and with the whole body, these latter will likewise participate in the violence; and they will do it so much the more, in proportion as the part immediately wounded has, from its attachments, its texture, elasticity, or importance to life, a greater connexion with the stability, or with the functions of the rest. Hence, a shot, striking against a tendon, or a bone, in one of the extremities, will produce a greater concussion, than if it struck only against softer parts.

A shot, striking against a muscle in action, will produce more concussion, than if it struck against the same part of the same muscle at rest. And a shot, striking the head, or wounding the liver, lungs, or intestinal canal, will generally bring on instantaneous derangement of the whole

system, with which the functions of these parts are so closely connected. To all this must be added an alarm, which takes sudden possession of the mind, and is increased by the uncertainty of the patient about his real state. Such apprehension, the most determined courage, is not always able to withstand. (See a *Treatise on Gun-shot Wounds*, by Thomas Chevalier, Part 1. sect. 7.)

A ball, when it strikes a part of the body, may cause four kinds of injury. 1. It may only occasion a contusion, without penetrating the part, on account of its being too much spent, or of the oblique way in which it strikes the surface of the body. 2. It may enter and lodge in the surface of a part; in which case, the track of the wound has only one aperture. 3. It may pierce through and through; and then there are two openings, one at the entrance, the other at the exit of the ball. The circumference of the aperture, where the shot entered, is usually depressed: that of the opening, from which it came out, elevated. At the entrance, there is commonly more contusion than at the exit of the ball. The former is generally narrower; the latter wider, and more irregular, especially when the round smooth figure of the ball has been changed by its having struck a bone. 4. A cannon-ball may tear off a whole limb. (*Richter's Anfangsgrunde der Wundarzneykunst*, Band 1.)

Gun-shot wounds differ very much, according to the kind of body projected, its velocity, and the nature and peculiarities of the parts injured. The projected bodies are mostly bullets, sometimes cannon-balls, sometimes pieces of broken shells, and very often, on board of ship, splinters of wood. From the contusion, which the parts suffer, on the violent passage of the ball through them, there is most commonly a part of the solids surrounding the wound deadened, which is afterwards thrown off in the form of a slough, and which prevents such wounds from healing by the first intention, and makes most of them necessarily suppurate. This does not take place equally in every gun-shot wound, nor in every part of the same wound; and the difference commonly arises from the variety in the velocity of the body projected; for, where the ball has passed with little velocity, which is sometimes the case at their entrance, but, still more frequent at the part last wounded, the injury may often be healed by the first intention. (*J. Hunter*, p. 523.)

Foreign bodies are more frequently met with in gun-shot wounds than any others, and are commonly of three kinds. 1. Pieces of clothing, or other things, which the ball forced before it into the limb. 2. The

ball itself. 3. Loose splinters of bone. It is only when the ball strikes a naked part, touches no bone, and goes through and through, that the wound can be free from extraneous matter. Foreign bodies are the cause of numerous unfavourable symptoms, by irritating sensible parts, and exciting pain, inflammation, convulsions, hemorrhage, long suppurations, &c. They are constantly more productive of such evils, the more uneven, pointed, and hard they are. Hence spiculæ of bone are always the most to be dreaded. (*Richter.*)

When a ball strikes a bone, the concussion produced is another occasion of bad symptoms, to be added to those already mentioned. When slight, its effects are confined to the injured limb. Sometimes they extend to the neighbouring joints, in which they produce inflammation and abscesses.

It is commonly stated, in surgical books, that when a cannon ball tears off a limb, it produces a most violent concussion of the whole body, and a general derangement of all its functions. This, however, is by no means always true. I have lately seen, in London, a young sailor, whose arm was completely torn off at the shoulder, by a cannon-ball from one of the forts at Guadaloupe, in March 1808; he suffered no dreadful concussion of his body, nor were his senses at all impaired. This case was very remarkable, as the scapula was so shattered, that Mr. Cummings, of Antigua, was under the necessity of removing the whole of it. The patient recovered in two months. From the account I heard, I do not believe the axillary artery bled immediately after the accident. The young man was lately shewn to the gentlemen of St. Bartholomew's Hospital, quite well.

There is one curious effect which occasionally follows gun-shot wounds; but, I do not pretend to understand the rationale of it. viz. inflammation and suppuration of some internal viscus, especially of the liver. Several such cases are related in the *Mém. de l'Acad. de Chirurgie*.

From the circumstance of the inner surface of gun-shot wounds being more or less deadened, they are late in inflaming. But when a ball has fractured a bone, which fracture has occasioned great injury of the soft parts, independently of that caused immediately by the ball itself, the inflammation will come on as quickly, as in cases of compound fracture; because the deadened part bears no proportion to the laceration or wound in general. (*J. Hunter, p. 524.*)

From the same circumstance of a part being often deadened, gun-shot wounds

frequently cannot be completely understood in the first instance, for, in many cases, it is at first impossible to know what parts are killed, whether bone, tendon, or soft part. Nor can this be ascertained till the slough separates, which often makes the wound much more complicated than was previously imagined. For, very often, some viscus, or a part of some viscus, or a part of some large artery, or even a bone, has been killed by the violence. If a piece of intestine has been killed, the contents of the bowel will begin to come through the wound when the slough separates. If a portion of a large blood-vessel be killed, a profuse, and even fatal hemorrhage may come on, when the slough is detached, although not a drop of blood may have been previously lost. (*See Hunter, p. 525.*)

When the ball moves with little velocity, the mischief is generally less; the bones are not so likely to be fractured; the parts are less deadened, &c. However, when the velocity is just great enough to splinter a bone, which is touched, the splintering is generally more extensive, than if the impetus of the ball had been much greater, in which case, it would rather have taken a piece out. When the ball moves slowly, it is more likely to be turned by any resistance it may encounter in its passage through parts, and hence the wound is more likely to take a winding course.

When a ball enters a part with great velocity, but is almost spent, when it comes out again in consequence of the resistance it has met with, there may be a good deal of sloughing about the entrance, and little or none about the exit, owing to the different degrees of celerity with which the ball traversed the parts. (*See Hunter.*)

Gun-shot wounds may have either one, or two apertures, according as the ball has lodged, or passed quite through the part. In some cases, the openings are diametrically opposite each other; in others they are not so, the direction of the ball having been changed by the resistance, which it has met with from a bone, cartilage, tendon, &c. Thus a ball has been known to enter just on the inside of the ankle, and come out near the knee, to enter the fore-head and come out at the temple, &c. (*Richerand, Nosographie Chirurgicale, Tom. 1, p. 219, Edit. 2.*) The opening, where the ball enters, is always smaller than that from which it escapes, and its margin is forced inwards, while the circumference of the other aperture is quite prominent. The contusion and injury, which the parts suffer, are also greatest about the entrance of the ball,

owing to the more considerable impetus, with which it moves. The yellowish livid hue, around gun-shot wounds, is a sort of ecchymosis, or extravasation of blood. The injured member is often benumbed and stupefied, and, when mortification occurs, it spreads with extraordinary rapidity. When the whole constitution is thrown into this kind of torpor, the most fatal consequences are to be apprehended. "C'est dans cet état, (says Richerand) que mourut le chevalier, dont parle Quesnay; l'état d'hébététe était tel, que cet individu à qui l'on proposa l'amputation de la jambe, répondit que ce n'était pas son affaire" (*Nosographie Chirurg. Tom. 1, p. 221, Edit. 2.*) In cases of gun-shot wounds, sudden shiverings, syncope, and nervous symptoms are not unfrequent. Such occurrences, with other bad effects, made the ancients suspect, that something poisonous was carried into the wound; an opinion, which is now well known to be erroneous.

When there is only one opening, we may infer, that the wound contains a foreign body. When there are two apertures, the ball has escaped; but, pieces of the clothes, &c. may still be lodged in the part.

As the ends of the torn vessels are contused and compressed, gun-shot wounds have little propensity to bleed much, and, unless very considerable vessels are lacerated, they do not bleed at all: sometimes not in this case. The greatest danger of bleeding is always when the dead parts are detached, eight or ten days after the injury. Angular uneven bodies, such as pieces of iron, cut lead, &c. are more liable to occasion far more dangerous wounds, than round even bodies, like leaden bullets. Wounds occasioned by a small shot, are frequently more perilous, than others produced by larger balls: because their track is so narrow, that it cannot be traced, nor consequently the extraneous body itself extracted. Such a shot oftentimes injures a viscus, when there is not the smallest external symptom of the occurrence. Sometimes a great part of the danger, also, arises from the number of the shots which have entered.

In a subsequent section of this article, the valuable observations of M. Larrey, upon the question of amputation, in cases of gun-shot wounds, will be fully detailed.

TREATMENT OF GUN-SHOT WOUNDS.

The first thing in the treatment of a gun-shot wound in one of the extremities, is to determine, whether it is most advis-

able to amputate the limb immediately, or to undertake the cure of the wound. When a bone, especially at a joint, is very much shattered; when the fleshy parts, particularly the great blood-vessels and nerves, are lacerated; when the whole limb has suffered a violent concussion, and is cold and senseless; there is no hope of preserving it. In this case, it is the surgeon's duty to amputate at once, and not to delay till mortification commences. But, besides this violent degree of injury, in which the propriety of amputation is obvious, there are several lower degrees, in which it is often a difficult thing to decide whether amputation is necessary or not. Here the surgeon must look not only to the injury, but also to the patient's constitution, and even to external circumstances, such as the possibility or impossibility of procuring good accommodation, rest, attendance, and pure air. But it is impossible to determine the necessity of amputation by general rules. In every individual case, the surgeon must consider maturely the particular circumstances, before he ventures to decide. The grounds against the operation are; the pain which it causes at a period when the whole system is disordered by a terrible injury; the privation of a limb; and frequent examples, in which nature, aided by judicious surgery, repairs the most horrible wounds. The following are the reasons in favour of the operation. By it the patient gets rid of a dreadful contused wound, which threatens the greatest peril, and which is exchanged, as it were, for a simple incised one. The pain of amputation is not of more moment than the pain which the requisite incisions, and the extraction of foreign bodies, would cause in case the operation is abandoned. The wound of amputation is not so much to be apprehended, as experience shews, that incisions, in cases of gun-shot wounds, are not only exempt from particular danger, but are often useful. The loss of the limb cannot be taken into the account; for, the surgeon only undertakes the operation where he designs to save the patient's life by that privation, and anticipates that the part itself cannot be preserved. Even, if he should deprive the patient of a limb, that, perhaps, might have been preserved, there is this atonement, that he can furnish him with an artificial leg, which often proves far more serviceable, than the lost limb would have proved, had it been preserved. Should the operation be fixed on, it is to be immediately performed above the wound. (*Richter's Ansunsgrunde der Wundarzneykunst, Band 1.*)

When amputation is deemed unneces-

sary, the surgeon, according to customary precepts, is to enlarge the wound by incisions. Such a dilatation has been said to have numerous advantages; to facilitate the extraction of foreign bodies; to occasion a topical bleeding, and afford an outlet for the extravasated fluid in the circumference of the wound; to convert the fistulous form of the track of the ball into an open wound; and, lastly, to divide ligamentous aponeuroses, which otherwise might give rise to spasmodic and other untoward symptoms.

More modern experience, however, shews (*Hunter, p. 529.*) that the utility of such incisions has been overrated; that they generally increase the inflammation, which, in these cases is so much to be apprehended; that wounds which are not dilated, commonly heal more speedily, than others which are; and, that there are only a few cases, in which incisions are beneficial.

The cases of gun-shot wounds are various. Sometimes the track of the ball lies superficially under the skin, and only has one opening. When it lies in soft parts, and the ball has neither touched a bone, nor a considerable blood-vessel, all incisions are useless, let the wound have one or two apertures. Though dilating the wound has been practised with a view of giving vent to matter, eschars, and foreign bodies, and even its whole track has been laid open, when superficial; yet, experience proves the inutility of such steps. As in the skin there is a real loss of substance, arising from a portion being driven inward before the ball, it follows, that the opening of a gun-shot wound must be more capacious than that of a punctured one. By the separation of sloughs, the wound becomes still more dilated, so that not only matter, but foreign bodies which approach the skin, may easily find an exit. Besides, incisions commonly close again very soon, and in a few days the wound falls into the same state, as if no dilatation at all had been made.

When a cannon-ball has torn off a limb, some advise the amputation of the stump, to procure the patient an even smooth incision, instead of an irregular, jagged, and highly dangerous wound. As the limb has commonly suffered a violent concussion, is almost bereft of sense, and power of motion, and the bone frequently has a fissure extending some way upward, the amputation is also recommended to be done, if possible, above the nearest joint. Others condemn the operation in this instance, asserting, that such wounds may sometimes be healed, and that the constitution, immediately after such violence, is

not in a favourable state for submitting to such a painful measure. But, as when the operation is not done, this kind of injury requires large and free incisions, for the extraction of foreign bodies, the shortening of projecting muscles and tendons, the discharge of extravasated fluids and abscesses; and, as these incisions are likely to occasion at least as much irritation as amputation itself, without being productive of equal good, the last objection is not very weighty. The operation may, also, in many cases, be delayed until the immediate irritation of the injury on the system is over. The occasional healing of such wounds only proves, that it is not altogether impossible, in every instance, to effect a cure without amputation. The surgeon can the more readily make up his mind to amputate in this case, as it does not occasion the loss of a limb. However, it is very credible, that the injury may sometimes be so conditioned, and the circumstances in which the patient finds himself such, that there are good grounds for deeming the operation unnecessary, and even pernicious. No one would be justified in amputating above the knee, when the limb is injured at the foot or ankle.

In gun-shot wounds, ligamentous fibres, and fasciæ, are often found going quite across them. It is advised to divide such parts completely, lest, when the wound inflames, they should cause violent spasms and nervous symptoms, and afterwards impede the discharge of matter and foreign bodies. No doubt this counsel is judicious. However, it is frequently difficult, at first, to discover and divide such parts, and then it is better to defer the incision until one can easily get at them without irritating the wound, and it is manifested, that their remaining undivided is the cause of inconvenience. These remarks are, also, applicable to membranous expansions perceptible at the sides of the wound, and to entire fasciæ, stretched over the inflamed muscles.

The extraction of foreign bodies ranks as one of the most urgent motives for the dilatation of the wound, and, no doubt, it is right to remove, at first, as many of them as possible. Their lodgment irritates the wound, causes violent nervous and inflammatory symptoms, and copious suppuration; circumstances which the timely extraction of them may prevent. Yet, let it be remembered, that the extraction of foreign bodies is frequently attended with immense irritation, and that, while they lie too firmly fixed in parts, it is often a matter of impossibility. After the sloughs have separated, and the wound has become widened, suppuration

frequently does not prevail long before the extraneous substances become loose, spontaneously approach the skin, and easily admit of removal without any dilatation. In cases, where, from necessity, foreign bodies have not been removed at first, no disadvantages have occasionally resulted from their continuance.

Hence, it is prudent, at first, to extract only such foreign bodies as are near the external opening, quite loose, and removeable without much irritation; or such as press on parts of importance, and, thereby excite dangerous symptoms. The surgeon should avoid interfering with those which are deeply and firmly lodged in the wound. He should await suppuration, and the detachment of sloughs, and when the foreign bodies become moveable and apparent, he should extract them, with or without an incision, as circumstances may demand. The examination of the wound ought to be made as much as possible with the finger, which irritates less, and feels more distinctly, than a probe. A great variety of instruments have been devised, either for ascertaining the position of balls, and other foreign bodies in gun-shot wounds, or for extracting them. But, however numerous and diversified bullet-drawers may be, they all admit of being divided into three kinds. The first are constructed on the principle of a pair of forceps. Others are shaped more or less like spoons. And a third description are made on the plan of a cork-screw, or worm. These last are only designed for cases, in which the ball is fixed in the substance of a bone, and is quite immovable; for, if it were lodged in the soft parts, the pressure, requisite for introducing the screw into it, would injure and lacerate the parts at the bottom of the wound. Bullet drawers, constructed on the plan of forceps, have the inconvenience of not being adapted for seizing the ball, unless their blades are expanded, which always stretches the wound, and creates a great deal of irritation. Forceps have been contrived with blades, which can be introduced separately, and then joined together with a screw. I do not know, whether there is any such instrument, that will grasp a ball, without being first expanded; but, it might easily be made, and would be found advantageous in military practice. Perhaps, when a ball lies superficially, the fingers, or a small pair of forceps, will serve to extract it most conveniently. In many other examples, bullet drawers, constructed on the principle of a spoon, are the best, that can be used. Richerand speaks of a superior instrument, for the extraction of balls, as follows: "De tous

ces instrumens, le meilleur sans doute, est celui de mon illustre collègue dans la chaire de Pathologie Chirurgicale, M. Percy, ce chef si distingué de la chirurgie militaire. Son tireballe offre la réunion des trois genres; il remplit à la fois l'office de pince à forceps, de cuillier, et de tirefond." (*Nosographie Chirurgicale, Tom. 1; p. 223, Edit. 2.*)

The event of the treatment above recommended, is various. Extraneous substances remaining in the wound, either loosen gradually, and come into view so as to be easily removeable; or they continue concealed, prevent the cure, and give birth to a fistulous ulcer. In some instances, the wound closes, and the foreign bodies remain in the limb during life, without inconvenience; and, in other cases, after a time, they bring on a renewal of inflammation and suppuration. Sometimes a foreign body varies its situation, sinking down, and afterwards making its appearance at a different part, where it may excite inflammation and suppuration.

When the ball lodges in the wound, it is usually difficult to trace it, as the parts collapse after its passage. The ball does not regularly take a straight direction through the injured part, but, oftentimes, a very tortuous one. The latter circumstance is more apt to occur, as the ball is more spent. In every case, in which it is not easily discoverable, all painful examinations should be abandoned, and the foreign body left in its situation, where it rarely creates any trouble.

Sometimes, the ball may be both easily found and extracted. At other times it lodges on the opposite side of the limb, closely under the skin. If the integuments, under which the ball is lodged, should be so contused that they will probably slough, they are to be considered as already dead, and an opening is to be made in them for the extraction of the ball. But when the ball lies so remotely from the skin that it can only just be felt, and the skin itself is quite uninjured, no counter-opening ought to be made. The wound heals better when the ball is left in, and far less inflammation takes place in the vicinity of this extraneous body, than about the orifice of the wound. A counter-opening always renders the inflammation at the bottom of the wound, as great as at its orifice. It is better to let the wound heal up, and extract the ball afterwards. (*See Hunter, p. 541.*)

Sometimes the ball penetrates the spongy part of a bone, and lodges firmly in it. When it has only entered superficially, it may sometimes be loosened and extracted, by means of an elevator with a thin and

somewhat curved extremity, and when it is more firmly fixed, a screw bullet drawer will sometimes serve for its removal. Should the attempt fail, hope may still be entertained, that, when suppuration takes place, it will become loose, and admit of extraction. In case nothing of this kind should occur, some advise the employment of a trepan to remove the ball from its situation. As this cannot be done without great irritation, and experience proves that a ball may lie in a bone during life, without occasioning unpleasant symptoms, it is obviously preferable to allow it to remain. (*Richter's Anfangsgr. der Wundarzn. Band 1.*)

Besides these principal circumstances, there are various contingent ones, which often demand a particular mode in making the incisions, and in the subsequent management. To explain them all here is impossible. Hemorrhage from a torn artery of considerable magnitude, for which a ligature is necessary, may require incisions to get at the vessel.

As soon as the requisite incisions are made, and foreign bodies extracted, the prime objects in the treatment of gun-shot wounds are then accomplished, and the rest is, in reality, not different from the surgery of other wounds.

With regard to probing gun-shot wounds; when it is evident that the shot has passed out, and no particular object can be fulfilled by introducing an instrument, it is often better to dispense with such examinations, at least till suppuration has come on. Introducing any instrument is generally productive both of pain and irritation. But when the ball, or any other extraneous substance, has lodged in the wound, and its situation is not immediately evident, it will often be advisable to search for it at once, that in order, if its situation will allow, it may be extracted before inflammation begins. The surgeon, therefore, considering all the circumstances which can assist him in forming a reasonable conjecture of the course of the wound, must give to a probe that curvature, or form, which he thinks most likely to pass readily along it, and must then proceed to make the examination. But, when this is very painful, and the course of the wound obscure, it will often be better to desist, and renew the search when suppuration has taken place, when it can be undertaken with more ease, and a greater prospect of success. When gun-shot wounds are inflamed, the tenderness and swelling of the parts are peculiarly strong reasons against painful probings, or efforts to extract foreign bodies, as long as this state

lasts. (See *Chevalier's Treatise on Gun-shot Wounds*, p. 67, 68 Edit. 3.)

There is no fact in the practice of surgery better established, than that the cramming of narrow stabs and gun-shot wounds with lint is particularly hurtful. The only possible reason for doing so in the latter cases must be to keep the orifice of the wound from healing up, and confining extraneous bodies, matter, &c. The apprehension of this happening at first is quite unfounded; for the inside of the mouth of the injured part is lined with a slough or eschar, which must necessarily be detached before the parts can heal. The first dressings, therefore, should be quite superficial, and of a mild unirritating nature. Hunter used to employ fomentations, pledgets of simple ointments, and, frequently, over the latter an emollient poultice. In the suppurative stage of gun-shot wounds, poultices are also the best applications, and a little piece of lint may be gently introduced into the mouth of the wound in order to preserve an outlet for the matter, extraneous bodies, and sloughs, which are making their way outward.

Possessing these ideas, I cannot altogether approve the following directions, though they are certainly better than are given in many surgical books "A small bit of soft lint may be placed lightly between the lips of the wound, in order to keep it from closing. In some instances, it should be introduced a little beyond the lips, in order to conduct off the fluids effused, and to prevent irregular adhesions from forming near the surface during the inflammatory stage; as these would impede the direct exit of the discharge. But the wound is not to be filled with lint, much less crammed with it. A pledget of some simple ointment being then laid on, with tow or cloths to receive the discharge, and these prevented from coming off by a bandage loosely applied, the patient may be put to bed, and so placed, if possible, as to keep the orifice of the wound dependent." (*Chevalier*, p. 125, 126.) The reasons for what I consider objectionable, namely, introducing lint on first dressing the wound, are too frivolous to need comment.

When the track of the ball has two apertures, some advise a seton to be drawn through it, with a view of preventing a premature closure of the wound, and introducing proper applications. A seton is, also, imagined to give free vent to pus, and to promote the evacuation of foreign bodies. But a gun-shot wound is little inclined to close prematurely, and a seton rather obstructs the exit of pus, and may

as easily push foreign bodies deeper, into the limb as out of it. There are preferable modes of applying the necessary remedies, and, as a seton is an extraneous substance itself, its employment must be deemed pernicious.

Gun-shot wounds require, in general, the employment of antiphlogistic means, just as other cases attended with equal inflammation do. When they are in the inflamed state, the application of leeches is highly proper.

Bleeding is recommended in these cases, and in such a manner, as if it were of more service in them than wounds in general. But the necessity for the practice is really not greater than in other wounds which have done the same degree of mischief, and from which the same quantity of inflammation and other consequences are expected. Bleeding is certainly proper here, just as it is in all considerable wounds attended with a strong full habit, and great chance of extensive inflammation, and much symptomatic fever. In every instance, however, the practitioner must take particular care not to be too bold in the practice of bleeding; for when the patient is reduced below a certain degree, his strength is inadequate to support the large and long-continued suppurations which often cannot be avoided. (See *Hunter*, p. 563, 564.)

As the orifices of the vessels torn by the ball, are compressed, and as it were obliterated, considerable hemorrhage is seldom remarked at first. But, after some days, and frequently at a very late period, when the sloughs separate, very copious hemorrhages are apt to occur, which are the more dangerous as they come on unexpectedly, and, oftentimes, when the suppuration has already induced great debility. A sense of heaviness, throbbing, and plethora, at the wounded part, often announces the approach of such an event. The surgeon himself may occasion the bleeding, by removing the dressings carelessly. Hence, in every case, where there is reason to apprehend from the situation of the wound, that a considerable vessel is injured, the patient must be constantly and attentively watched, and every thing necessary for the immediate stoppage of the hemorrhage must be provided.

Another kind of hemorrhage, still more dangerous than the former, particularly occurs in such gun-shot wounds, as have long been in a state of copious suppuration. The blood does not issue from one individual vessel, but from the whole surface of the wound, as from a sponge, and is so thin as to resemble blood and water. This hemorrhage is very danger-

ous, because it is particularly apt to exhaust the patient, who is already extremely debilitated, and its causes are difficult of removal. The case demands the exhibition of bark, alum, and diluted sulphuric acid. Decoctions of bark, and muriatic acid, may, at the same time, be applied to the wound. (*Richter*.)

Sometimes, in gun-shot wounds, the inflammation lasts very long, and there is no appearance of suppuration. In other instances, fresh inflammation comes on suddenly, during the suppurative stage, without any evident cause, and puts a stop to the secretion of matter. Sometimes the wound suppurates to an extraordinary degree, without any perceptible reason. All these circumstances often depend on splinters of bone remaining behind, which should be extracted as soon as it is practicable. (*Richter*.)

For the first days, the matter seldom assumes a healthy appearance; but as soon as the sloughs separate, it then becomes of a proper quality, and the wound is to be treated as a simple abscess.

Sometimes the healing process does not commence, after suppuration has prevailed for a considerable time. On the contrary, notwithstanding the exhibition of tonics, and a generous diet, the suppuration ceases to proceed vigorously, and the wound becomes unhealthy, and the matter thin. The bones shew no disposition to unite, and the patient, reduced by hectic symptoms, is rapidly advancing to dissolution. In this state, life may sometimes be preserved by amputation; the *anceps*, but *unicum remedium*. We ought never to be deterred from undertaking the operation by the fever and weakness, which frequently soon disappear when the local cause is removed.

OF AMPUTATION IN CASES OF GUN-SHOT WOUNDS.

I think a section upon this subject well deserves a place in the present article, more especially, as I am informed, that this dictionary is in the hands of a vast number of military and naval surgeons, and the generality of practitioners are not sufficiently impressed with the advantages of *immediate* amputation in every instance, in which the operation is considered indispensable.

After the battle of Fontenoy, in the year 1756, the Royal Academy of Surgery in France offered a prize for the best dissertation on the gun-shot injuries requiring immediate amputation, and on other cases of the same nature, where the operation, though deemed inevitable, might be delayed. "*L'amputation étant absolument nécessaire dans les playes compliquées de fra-*

cas des os, et principalement celles qui sont faites par armes à feu, déterminer les cas où il faut faire l'opération sur le champ, et ceux où il convient de la différer, et en donner les raisons" The prize was adjudged to the dissertation of M. Faure, the main object of whose paper was to recommend delaying the operation. "The practice of M. Faure (says a critical writer) is followed by the most eminent surgeons of the present day in this country; it is recommended by Mr. John Hunter, in his treatise on gun-shot wounds; the support, however, which it derives from the notice of Mr. Hunter, arises more from the authority of his name, than from the strength of his arguments in its favour. That part of Mr. Hunter's work is, in our opinion, the weakest of all his practical writings. The propriety of immediate amputation, when its necessity is admitted to be sooner or later unavoidable, is enforced by writers, whose experience gives considerable importance to their opinions. Suffice it to name Le Dran, Ranby, Kirkland, and Larrey." (*London Med. Review*, No. 15, p. 244.)

Although in France, the academy of surgery thought proper to decree the prize to M. Faure, whose doctrine thus received the highest approbation, yet, in that country, very opposite tenets were set up by some men of distinguished talents and extensive military practice. M. La Martinière in particular wrote some excellent arguments in reply to M. Bilguer; arguments, which, I think, would do honour to the most accomplished surgeon of the age, in which we live. (See *Mémoire sur le traitement des plaies d'armes à feu*, in *Mém. de l'Acad. de Chirurgie*, Tom. 11, p. 1, Edit. in 12mo.) M. Boucher, of Lisle, was an advocate for the same side of the question. (See *Obs. sur des plaies d'armes à feu*, &c. in *Mém. de l'Acad. de Chirurgie*, Tom. 5, p. 279, &c. Edit. in 12mo.) And, of late, M. Larrey has proved most convincingly, that when amputation is to be done in cases of gun-shot wounds, nothing is so pernicious as to delay the operation. (See *Mémoires de Chirurgie Militaire*, Tom. 2, p. 451, &c.)

It becomes me here to state, that the principles, inculcated by M. Larrey, are, in point of fact, the same as those, which were so strenuously insisted upon by Mr. Pott, whose principal remarks on the necessity of amputation in certain cases, are detailed in another part of this publication. (See *Amputation*.) Mr. Pott, indeed, was not an army surgeon, and what he says, was not particularly designed to apply to military practice; but, he has represented, as well as any body can do, the propriety of immediate amputation for

injuries, which leaves no doubt, that such operation cannot be dispensed with.

The strongest body of evidence upon this matter, however, is adduced by M. Larrey, whose situation at the head of the medical department of the French armies has afforded him most numerous opportunities of judging from actual experience. "Upon this subject (says he) now that twenty years of continual war have carried our art to the highest pitch of perfection, there can only be one opinion. It is after having incessantly directed the medical service, all this time, in quality of head surgeon and inspector-general of the armies, that I proceed to discuss the different opinions delivered in the academy, and to settle definitively this great question, which I regard as the most important in military surgery.

"If we are to be told, that the amputation of a limb is a cruel operation, dangerous in its consequences, and always grievous for the patient, who is thereby mutilated; that, consequently, there is more honour in saving a limb, than in cutting it off with dexterity and success; these arguments may be refuted by answering, that amputation is an operation of necessity, which offers a chance of preservation to the unfortunate, whose death appears certain under any other treatment; and, that if any doubt should exist of amputation being absolutely indispensable to the patient's safety, the operation is to be deferred, till nature has declared herself, and given a positive indication for it. We are also justified in adding, that this chance of preservation is at the present day much greater, than at the epoch of the academy of surgery. We learn from M. Faure, that, of about three hundred amputations, performed after the battle of Fontenoy, only thirty were followed by success, whilst, on the contrary, says M. Larrey, we have saved more than three-fourths of the patients, on whom amputation has been done, and some of whom also had two limbs removed. This improvement is ascribed by M. Larrey, 1st to our now knowing better how to take advantage of the indications and favourable time for amputating. 2. To the dressings being more methodical. 3. To the mode of operating being more simple, less painful, and more expeditious, than that formerly in vogue."

OF IMMEDIATE AMPUTATION.

When a limb, that has received a gun-shot wound cannot be saved, amputation should be practised immediately. The first four and twenty hours, as M. Larrey

observes, are the only time that nature remains tranquil, and as in all dangerous cases, we must hasten to take advantage of this period, in order to administer the necessary remedy.

In the army, a variety of circumstances make the urgency for amputation still greater. 1. The inconvenience attending the transport of the wounded, from the field of battle to the military hospitals, in carriages badly suspended, the jolting of which would produce such disorder in the wound, and in the whole body, that most patients would die in the journey, especially if it were long, and the weather either extremely hot or cold.

2. The danger of a long continuance in the hospitals; a danger, which amputation materially diminishes, by changing a gun-shot injury into a wound, that may be speedily healed, and reducing the causes of fever, and the hospital gangrene.

3. The cases, in which there is a necessity for abandoning the wounded. In this circumstance, it is of importance to have amputated, for, after the operation, the patients may remain some days without being dressed, and the dressings are afterwards more easy. Besides, it might often happen, that these unfortunate objects would not meet with surgeons of sufficient skill to do the operation; a circumstance, says M. Larrey, that we have seen happen among certain nations, whose caravans, for the medical service of the army (*ambulances*) are not constructed like those in use with the French.

OF CASES, IN WHICH AMPUTATIONS SHOULD BE DONE IMMEDIATELY.

First case. A limb carried away by a cannon ball, or the explosion of a howitzer or bomb, requires amputation without any loss of time: the least delay puts the patient's life in danger.

The skin has been violently stretched and lacerated; the muscles have been ruptured and irregularly torn away; the tendons and aponeuroses lacerated; the nerves and vessels divided and forcibly dragged; lastly, the bones broken and smashed to a greater or lesser extent. These first effects are followed by a general, or partial commotion; by a kind of torpor in the injured part, and a good way above the wound; by a painful trembling in the remains of the member, an event, that is singularly afflicting to the patient; and by a local swelling, preceding the erethismus, which quickly shews itself. The hemorrhage, says M. Larrey, an accident much more to be apprehended, than has been supposed, often

comes on a few moments after the injury, and, if prompt succour were not afforded, would put a period to the patient's existence. "I can even declare, that, had it not been for the activity of the train of flying surgical carts (*ambulances volantes*) by means of which the wounded have always been dressed upon the field of battle, many soldiers would have perished from this accident alone."

If the operation is not speedily done, pain commences, fever occurs, and the functions become disordered; the irritation then increases, and convulsive motions take place. If the patient should not be a victim to these first symptoms, (continues Larrey) the solids, after having been distended in an inordinate degree, fall into a complete atony; and hence, gangrene of the stump is occasioned, the fatal consequences of which it is extremely difficult to prevent.

After this short exposition, it is easy to see, that, in this case, amputation ought to be practised immediately, and to delay the operation, and merely apply simple dressings, would be affording time for the preceding accidents to arise.

At Strasburgh, during the bombardment of the Fort of Kell, in 1792, three volunteers, says M. Larrey, had limbs shot off by the explosion of shells; one, an arm; another, a fore-arm; and the third, a leg. They were conveyed to the hospital for the wounded in this town, which was superintended by M. Boy, surgeon of the first class. Several days were suffered to elapse before amputation was performed: not one of the patients escaped.

At Mayence, after the retreat from Frankfort, M. Larrey acquaints us, that several of the wounded, who had had limbs shot off, did not have amputation done till some time afterwards, and not one of them recovered.

At Nice, after the taking of Saorgio, two amputations were practised at the hospital, No. 2; one of the fore-arm, the other of the arm, nine or ten days after the receipt of the injuries; both the patients died.

At Perpignan, in the hospital Brutus, M. Larrey visited two soldiers, on whom amputation had been done, seven or eight days after the receipt of gun-shot injuries in the action of the 14th of July, 1794. One had had a leg shot off; and the other, his right arm. Notwithstanding M. Larrey's utmost care, he could not save their lives; one died of tetanus, the other of gangrene.

In the month of August, 1806, two cannoniers of the guards, in discharging the artillery, had each a hand shot away,

and all the forepart of their bodies burnt. These were the two men, whose office it was to charge the gun. At the moment, when they had just rammed down the wadding on the cartridge, a spark, that had been left unextinguished, from the neglect to keep the touch-hole closed, set fire to the powder: the ramrod was violently repelled by the explosion, together with every thing that was situated in front of the charge. The right hand of one of the cannoniers was completely torn off, between the two phalanges of the carpus, and thrown more than two hundred paces. The counter shock even threw the man down into the ditch of the square of the Hôtel of Invalides. The left hand of the other cannonier was torn away, together with the fore-arm at the elbow joint, and also forced to a considerable distance. The tendons and muscles sustained vast injury from the violent manner in which the limbs were torn away, and the worst symptoms would have occurred, if amputation had not been instantly performed. But, as M. Larrey happened to be at the hospital, when these two soldiers were brought thither, he operated upon them immediately. In one, amputation was done at the wrist; and, in the other, at the lower third of the arm. The two operations were followed by complete success although the burns upon the face and chest, in both the patients, were serious and extensive.

Second case. When a body, propelled by gunpowder, strikes a limb, in such a manner, as to smash the bones, violently contuse, lacerate, and deeply tear away, the soft parts, amputation ought to be immediately performed. If this measure be neglected, all the injured parts will soon be seized with gangrene: and besides, as M. Larrey has explained, the accidents, which the gravity of the first case produces, will also here be excited.

Third case. If a similar body were to carry away a great mass of the soft parts, and the principal vessels of a limb, (of the thigh, for instance,) without fracturing the bone, the patient would be in a state demanding immediate amputation; for, independently of the accidents, which would originate from a considerable loss of substance, the limb must inevitably mortify.

Fourth case. A large biscayen strikes the thick part of a member, breaks the bone, divides and tears the muscles and destroys the large nerves, without, however, touching the main artery. According to M. Larrey, this is a fourth case, requiring immediate amputation; a proceeding, rendered indispensable by the

laceration, that has taken place in the limb, and by the commotion that has been produced through it.

Fifth case. If a spent cannon-shot, or one that has been reflected, should strike a member obliquely, without producing a solution of continuity in the skin, as often happens, the parts, which resist its action, such as the bones, muscles, tendons, aponeuroses, and vessels, may be ruptured and lacerated. The extent of the internal disorder is to be examined; and if the bones should feel, through the soft parts, as if they were smashed, and if there should be reason to suspect, from the swelling, and a sort of fluctuation, that the vessels are lacerated, amputation ought to be immediately practised. We learn from M. Larrey, that this is also the advice of M. Percy, an eminent French army surgeon. Sometimes, however, the vessels and bones have escaped injury, and the muscles are almost the only parts disordered. In this circumstance, we are enjoined to follow the counsel of M. La Martinière, who recommended making an incision through the skin. By this means, a quantity of thick blackish blood will be discharged, and the practitioner must await events. According to M. Larrey, such incision is equally necessary in the preceding case, before amputation, in order to ascertain the extent of the mischief, which the parts have sustained.

It is to such injury, done to internal organs, that we must ascribe the death of many individuals, which was for a long while attributed to the commotion produced by the air put in motion by the ball, when this, in grazing upon different parts of the body, alters them, or cuts off the column of air, which is to serve for respiration, just at the moment when it is about to enter the chest. (See *Ravaton's Traité des Plaies d'Armes à Feu*.)

Although, observes M. Larrey, this opinion has been sanctioned by surgeons of high repute, we may easily convince ourselves of its falsity, if we carefully consider, last, the direction and course of solid hard bodies, and their relation to the air, through which they have to pass; 2dly, the internal disorder, observable in the dead bodies of persons, whose death is imputed to the mere impression of the air, agitated by the ball; 3dly, the properties of the elastic substances, such as the integuments, cellular substance, &c. struck by the shot.

It is universally agreed amongst philosophers, that a solid body, moving in a fluid, only acts upon a column of this fluid, the base of which column is nearly equal to the surface, which the solid body

presents. (See *Le Vacher sur quelques particularités concernant les playes faites par armes à feu*, in *Mém. de l'Acad. de Chirurgie*, Tom. 11, p. 34, Edit. in 12mo.)

Thus a cannon-ball, in traversing a space equal to its diameter, can only displace a portion of air, in the relation of 3 to 2, compared with the size of the shot. This fluid, in consequence of its divisibility and homogeneity with the ambient air, is dispersed in all directions, and confounded with the total mass of the atmosphere. The effects of this aeriform substance amount to nothing, and not a doubt can be entertained, that if there is the slightest solution of continuity of any part of the body, it must depend upon the direct action of the ball itself.

If, besides, the quickness of the motion of a ball be considered, which quickness is known to diminish in an inverse ratio to the squares of the distance, it will be seen, that the space, through which the shot has passed, before striking the object, against which it was directed, will already have materially lessened the celerity of the projectile, while the motion of the column of air must be totally lost.

They who espouse the opinion, against which M. Larrey has written, found their argument upon a particular experiment, of which the following is a succinct account. With an air-gun, a ball is projected into a mass of argillaceous soft earth, placed upon a deal board, at two-thirds of the course of the projectile. Instead of a hole of a calibre equal to the ball, a crater is produced in this soft earth, twice, or thrice as wide as the shot, and of an oval shape. These appearances are imputed to the effect of the air forcibly impelled before the ball, the particles of the clay being thrown in all directions, and leaving an excavation accordingly.

But, says M. Larrey, is it not more probable, that this phenomenon is rather owing to the obliquity, which the ball meets with in the two lines, through which it passes, in order to enter, and makes its exit from this soft inelastic substance? For, in the first case, the ball has begun its parabola and, afterwards, the new movement, which the board in consequence of its resistance and elasticity, communicates to the ball, changes the direction of this body, and makes it take a different course. It is to these two angles, more or less open, of incidence and reflection, that according to M. Larrey, the dispersion of the particles of the argillaceous earth is owing, the effect being increased by the instantaneous projection which the point

of the wood, struck by the ball, makes against the clay, by reason of its elasticity, while the particles of this earth itself the more readily sink down again, as they are destitute of any elastic property.

The different movements which the ball describes in its course, and the elasticity of the skin, will now enable us to explain, how internal injuries are produced, without any external solution of continuity, and often even without ecchymosis. The motion communicated to the ball by the power, which projects it, is, for a given space, rectilinear. If, at this instance, it strikes against the body, it carries the part away to an extent proportioned to the mass, with which it touches the part. But, the ball, after having traversed a certain distance, undergoes, in consequence of the resistance of the air and the attraction of gravity, a change of motion, and now turns on its own axis, in the diagonal direction.

If the shot should strike any rounded part of the body, towards the end of its course, it will run round a great portion of the circumference of the part, by the effect of its curvilinear movement. It is also in this manner, observes M. Larrey, that the wheel of a carriage acts, in passing obliquely over the thigh, or leg, of an individual stretched upon the ground. In this case, the results are the same as those, of which we have been speaking. The most elastic parts yield to the impulse of the contusing body; while such as offer resistance, as, for instance, the bones, tendons, muscles and aponeuroses, are fractured, ruptured, and lacerated. For the same reason, it sometimes happens, that the viscera are similarly injured.

At first sight, all the parts appear to be entire; but, a careful examination will not let us remain long in doubt about the internal mischief. In this case, an ecchymosis cannot manifest itself outwardly, because the vessels of the skin, which communicate with the internal parts, are ruptured, because the extravasation of blood naturally takes place in the deep excavations, occasioned by the rupture of the muscles, and other parts, and because this fluid cannot make its way through the texture of the skin. Such extravasations can only be detected by the touch.

The foregoing reasoning is supported by experience. How often, says M. Larrey, have we not seen the ball carry away pieces of helmets, hats, cartridge-boxes, knapsacks, or other parts of the soldier's dress, without doing any other injury? The same ball, perhaps, takes off his arm, often at a time, when it is closely applied

to the body of his comrade, and, yet, the latter does not receive the slightest harm. The shot may pass betwixt the thighs, and these members hardly exhibit an ecchymosis at the points, which are gently grazed; the only example, adds M. Larrey, in which, ecchymosis does occur. In other instances, the ball severs the arm from the trunk, and the functions of the thoracic viscera are not at all injured.

M. Larrey then relates the following case. M. Méget, a captain, marching in the front of a square of men, in the heat of the battle of Altzey, 30th March 1793, had his right leg almost entirely carried away by a large cannon-shot, without the contiguous limb of his lieutenant, who was as close as possible to him, receiving the least injury. The violent general commotion excited, and the extreme severity of the weather, made this officer's condition imminently perilous. The progress of the symptoms, however, was checked by amputation, which was instantly performed. M. Méget was then capable of being conveyed to the hospital at Landau, fifteen leagues from the field of battle, where he got quite well.

M. Larrey declines relating numerous other analogous amputations, which he has been called upon to practise under the same circumstances. M. Buffy, a captain of the artillery of the army of the Rhine, was struck by a howitzer, his left arm being injured, and his head so nearly grazed, that the corner of his hat, which was placed forwards over his face, was shot away as far as the crown. This officer, the skin of whose nose was even torn off, was not deprived of his senses, and he was actually courageous enough to continue for some minutes commanding his company. At length, he was conveyed to the ambulance of M. Larrey, who amputated his arm: in about a month, he was well.

When balls strike parts obliquely, they produce in a lesser degree the effects, which arise from the incomplete collision of a shot: their tortuous course in the substance of a member is subject to curious varieties.

But, to return to the object of our present consideration, M. Larrey expresses his belief, that what have been erroneously termed *wind contusions*; if they are attended with the mischief above specified, require immediate amputation. The least delay makes the patient's preservation extremely doubtful. The internal injury of the member may be ascertained by the touch, by the loss of motion, by the little sensibility retained by the parts, which have been struck; and, lastly, by practising an incision, as already recommended.

In order to confirm the principle, which he endeavours to establish, in opposition to many writers, M. Larrey indulges himself with the following digression.

At the siege of Roses, two cannoniers, having nearly similar wounds, were brought from the trenches to the ambulance, which M. Larrey had posted at the village of Palau. They had been struck by a large shot, which, towards the termination of its course, had grazed posteriorly both shoulders. In one, M. Larrey perceived a slight ecchymosis over all the back part of the trunk, without any apparent solution of continuity. Respiration hardly went on, and the man spit up a large quantity of frothy vermilion blood. The pulse was small and intermitting, and the extremities were cold. He died an hour after the accident, as M. Larrey had prognosticated. This gentleman opened the body, in the presence of M. Dubois, inspector of the military hospitals of the army of the eastern Pyrenees. The skin was entire; the muscles, aponeuroses, nerves, and vessels of the shoulders were ruptured and lacerated, the scapulæ broken in pieces, the spinous processes of the corresponding dorsal vertebræ, and the posterior extremity of the adjacent ribs, fractured. The spinal marrow had suffered injury; the neighbouring part of the lungs was lacerated, and a considerable extravasation had taken place in each cavity of the chest.

The second cannonier died of similar symptoms, three quarters of an hour after his arrival at the hospital. On opening the body, the same sort of mischief was discovered, as in the preceding example.

In the German campaigns of the French armies, M. Larrey has met with several similar cases, and accurate examination has invariably convinced him of the direct action of a spherical body, propelled by means of gunpowder.

Sixth case. When the articular heads are much broken, especially those which form the joints of the foot, or knee, and the ligaments, which strengthen these articulations, are broken and lacerated, by the fire of a howitzer or by a biscayen, or other kind of ball, immediately amputation, says M. Larrey, is indispensable. According to this experienced writer, the same indication would occur, were the ball lodged in the thickness of the articular head of a bone, or were it so engaged in the joint, as not to admit of being extracted by simple and ordinary means.

It is only in this manner, that the patients can be rescued from the dreadful

pain, the spasmodic affections, the violent convulsions, the acute fever, the considerable tension, and the general inflammation of the limb, which, M. Larrey observes, are the invariable consequences of bad fractures of the large joints. But, adds this author, if the voice of experience be not listened to, and amputation be deferred, the parts become disorganized, and the patient's life is put into imminent peril.

It is evident, says he, that, in this case, if we wish to prevent the patient from dying of the consequent accidents, amputation should be performed before twelve, or at most twenty-four hours, have elapsed: even M. Faure himself professed this opinion, in regard to certain descriptions of injury.

Seventh case. According to M. Larrey, if a large biscayen, a small cannon-shot, or a piece of a bomb-shell, in passing through the substance of a member, should have extensively denuded the bone, without breaking it, amputation is equally indicated, although the soft parts may not appear to have particularly suffered. Indeed, the violent concussion produced by the accident, has shaken and disorganized all the parts; the medullary substance is injured, the vessels are lacerated, the nerves immoderately stretched, and thrown into a state of stupor; the muscles are deprived of their tone; and the circulation and sensibility in the limb are obstructed. Before deciding, however, M. Larrey cautions us to observe attentively the symptoms, which characterize this kind of disorder. This case can be supposed to happen only in the leg, where the bone is very superficial, and merely covered at its anterior part with the skin.

The following are described as the symptoms: the limb is insensible, the foot cold as ice, the bone partly exposed, and on careful examination, it will be found that the integuments, and even the periosteum, are extensively detached from it. The commotion extends to a considerable distance; the functions of the body are disordered; and all the secretions experience a more or less palpable disturbance. The intellectual faculties are suspended, and the circulation is retarded. The pulse is small and concentrated; the countenance pale; and the eyes have a dull moist appearance. The patient feels such anxiety, that he cannot long remain in one posture, and requests, that his leg may be quickly taken off, as it incommodes him severely, and he experiences very acute pain in the knee. When all these characteristic symptoms are conjoined, says M. Larrey, we should

not hesitate to amputate immediately; for, the leg would be attacked with sphacelus the same day, and the patient would certainly perish.

M. Larrey next adduces several interesting cases in support of the preceding observations.

Eighth case. When a large gynglimoid articulation, such as the elbow, or especially the knee, has been extensively opened with a cutting instrument, and blood is extravasated in the joint, M. Larrey deems immediate amputation necessary. In these cases, the synovial membranes, the ligaments and aponeuroses, inflame; the part swells, and erythismus rapidly takes place and acute pains, abscesses, deep sinuses, caries, febrile symptoms and death, are the speedy consequences. M. Larrey has seen numerous subjects die of such injuries, on account of the operation having been postponed with a hope of saving the limb. In his *Mémoires de Chirurgie Militaire*, Tom. 2, some of these are detailed.

Although a wound may penetrate a joint, yet, if it be small and unattended with extravasation of blood, M. Larrey informs us, it will generally heal, provided too much compression be not employed. This gentleman believes in the common doctrine of the pernicious effect of the air on the cavities of the body; yet, in this place, a doubt seems to affect him: speaking of the less danger of small wounds of joints, he says; "*a quoi tient cette différence, puisque l'air pénètre dans l'articulation dans l'un comme dans l'autre cas?*"

When two limbs have been at the same time so injured, as to require amputation, we should not be afraid of amputating them both immediately, without any interval. We have, says M. Larrey, several times performed this double amputation, with almost as much success, as the amputation of a single member. He has recorded an excellent case in confirmation of this statement. (*Mém. de Chirurgie Militaire*, Tom. 2. p. 478.)

When a limb is differently injured at the same time in two places, and one of the wounds requires amputation, (suppose a wound of the leg with a splintered fracture of the bone, and a second of the thigh, done with a ball, but, without any fracture of the os femoris, or other bad accident) M. Larrey recommends us, first to dress the simple wound of the thigh, and amputate the leg immediately afterwards, if the knee be free from injury. When it is necessary to amputate above this joint, the less important wound need not be dressed, till after the operation, provided it can be comprehended

in the section of the member, or be so near the place of the incision as to alter the indication. When the wound, demanding amputation, is the upper one, the operation of course is to be done above it, without paying any regard to the injury situated lower down.

M. Larrey, however, approves of deferring the operation, when delirium, convulsions, and inflammation prevail on the first receipt of the injury. In this circumstance, we are advised to take measures for appeasing these accidents; the progress of nature is to be carefully observed; and the first moment of quiet is to be taken advantage of, for the performance of the operation. (See *Larrey's Mém. de Chirurgie Militaire*, Tom. 2. p. 451, &c.)

OF GUN-SHOT WOUNDS, IN WHICH AMPUTATION MAY BE DEFERRED.

If, says M. Larrey, it be possible to specify the cases, in which amputation ought to be immediately performed, it is impossible to determine *a priori* those, which will require the operation subsequently. One gun-shot wound, for example, will be cured by ordinary treatment, while another, that is at first less severe, will afterwards render amputation indispensable, whether this be owing to the patient's bad constitution, or the febrile complaints, which are induced. However this may be, the safe rule for fulfilling the indication, that presents itself, is to amputate consecutively only in circumstances, in which, every endeavour to save the limb is manifestly in vain. Upon this point M. Larrey's doctrine differs from that of Faure.

The latter practitioner admits cases, which he terms cases of the *second kind*, in which he delays amputation, not with any hope of saving the limb, but, in order to let the first symptoms subside. The operation, done between the fifteenth and twentieth day, appears to him less dangerous, than when performed immediately after the receipt of the injury. At the above period, according to M. Faure, the commotion, occasioned by the gun-shot injury is dispelled; the patient can reconcile himself to amputation, the mere mention of which fills the pusillanimous with terror in a greater or lesser degree; the debility of the individual is no objection; and it is laid down as an axiom "that the consequences of every amputation, done in the first instance, are in general extremely dangerous." In support of his theory, M. Faure adduces ten cases of gun-shot injuries, in which after the battle of Fontenoy, the operation

was delayed, in order that it might afterwards be performed with more success: a plan, which, according to the author, proved completely successful. (See *Prix de l'Acad. de Chirurgie*, Tom. 8, Edit. in 12mo.)

This division of the cases for amputation into two classes, not consistent with nature, observes M. Larrey, has been the cause of a great deal of harm. Very often the partisans of M. Faure have not dared to resort in the first instance to amputation, the dangers of which they exaggerate; while, on other occasions, they amputate, consecutively, without any success.

The effects of commotion, instead of increasing, says M. Larrey, gradually diminish and disappear after the operation. The proximate cause of all the ill effects of such commotion, is ascribed by this experienced author to the violent percussion of the foreign body, which percussion is propagated extensively to every part that is susceptible of it. According to the same writer, it is also owing to the laceration, or incomplete section of the injured nerves, and the inflammatory turgescence of the vessels. The speedy amputation of the limb must then produce a favourable change in the whole animal economy. In fact, the tense nerves, on being divided, says he, are set at liberty, and the fluids circulate with greater facility; the irritation, which always accompanies terrible injuries, is appeased; and the loaded vessels get rid of their redundant blood, and contract. Constriction, inflammation, and erethismus, which always complicate great lacerated wounds, according to M. Larrey, are thus prevented. It is then proved, says he, that the commotion, so far from being a counter-indication to immediate amputation, is a reason that should incline the surgeon to operate. Such was the sentiment of La Martinière and Boucher.

M. Larrey next cites some cases in support of the foregoing observations; but, these I shall here omit, in order that the present article may not be immoderately enlarged.

Neither ought the patient's alarm to be a reason for postponing the operation; for, according to M. Larrey, the patient, just after the accident, will be much less afraid of the risk, which he has to encounter, than after the expiration of the first four and twenty hours, when he has had time to reflect upon the consequences of the injury, or of amputation. This remark has been made by the illustrious Paré.

"Experience, agreeing with my theory, (says M. Larrey) has proved both to the army and navy surgeons, that the bad

symptoms which soon follow such gun-shot injuries, as must occasion the loss of a limb, are much more to be dreaded, than those of immediate amputation. Out of a vast number of the wounded, who suffered amputation in the course of the first four and twenty hours after the memorable naval battle of the first of June, 1794, a very few lost their lives. This fact has been attested by several of our colleagues, and, especially, by M. Fercoc, surgeon of the ship *le Jemmappe*."

The following is said to be an extract from one of his letters.

"After the naval engagement on the first of June, 1794, a great number of amputations were done immediately after the receipt of the injuries. Sixty of the patients, whose limbs had been thus cut off, were taken to the naval hospital, at Brest, and put under the care of M. Duret. With the exception of two, who died of tetanus, all the rest were cured; and there was one, who had had both his arms amputated. The surgeon of the *Téméraire*, which ship was captured by the English, was desirous in compliance with the advice of their medical men, to defer the operation, which many of the wounded stood in need of, till his arrival in port; but, he had the mortification to see them all die during the passage, &c."

M. Larrey next acquaints us, that, when he was sent to the army of Italy, in 1796, he had also the pain of seeing, in the hospitals, great numbers of the wounded fall victims to the confidence, which many of the surgeons of that army placed in the principles of M. Faure. General Bonaparte saw, that the *ambulance volante* was the only thing, that, in the event of fresh hostilities, could prevent such accidents; and, in consequence of his orders, M. Larrey formed the three divisions d'ambulance which are described in his *Mémoires de Chirurgie Militaire*.

Since this period it has always been customary in the French armies, on the day of battle, to make every preparation for performing amputations as speedily as possible. The mere sight of these *ambulances*, (always attached to the advanced guard,) says M. Larrey, encourages the soldiers, and inspires them with the greatest courage. On this occasion, the following anecdote is cited from Ambrose Paré.

This famous surgeon having been urgently sent for by the duke de Guise, besieged in Metz, to attend the wounded of his army, who were in want of assistance, Ambrose Paré was shewn to the frightened soldiers, at the breach. Upon this,

they immediately filled the air with shouts of the most lively joy, and cried out: "*Nous ne pouvons plus mourir, s'il arrive que nous soyons blessés, puisque Paré est parmi nous*." Their courage revived, and their confidence in this skillful surgeon, contributed to the preservation of a place, before which a formidable army was destroyed.

M. Larrey desires us to interrogate the invalids, who have lost one, or two of their limbs, and nearly all will tell us, that they suffered amputation a few minutes after the accident, or in the first four and twenty hours.

"If Faure now retains any partisans," says M. Larrey, "I recommend them to repair to the field of battle, the day after an action; they would then soon be convinced, that, without the prompt performance of amputation, a great number of soldiers must inevitably lose their lives. In Egypt, this truth was particularly manifested."

The following communication upon this point was made to M. Larrey by M. Masclet, a French surgeon on duty at Alexandria.

"In the naval hospital of this port, I have seen eleven soldiers, or sailors, who were wounded in the naval action off Aboukir, and who had suffered amputation in the first four and twenty hours. In five of these cases, the operation had been done on the arm; in two, on the thigh; and, in three others, on the leg. All these men are recovering. In the army hospital, there have been only three thigh-amputations, which were performed seven or eight days after the battle, and these three patients died a few days after the operation, although the operation was done methodically, and no grave symptoms prevailed at the time of its performance. You see, sir, experience has, in this instance, quite confirmed your principles."

In 1780, during the American war, we are informed by M. Larrey, that the surgeons of the French army performed a great number of amputations, according to the opinion then generally adopted in France, that the operation should not be undertaken till after the subsidence of the first symptoms. Almost all the patients, thus treated, died after the operation. On the contrary, the Americans, who had the boldness to amputate immediately (or in the first twenty-four hours) upon many of their wounded countrymen, lost only a very few. Yet, M. Dubor, at that time surgeon to the Artois dragoons, and from whom M. Larrey has collected this fact, relates, that the situation of the hospital for the French

wounded was, on many accounts, the most advantageous. (See *Dubois's These Inaugurale soutenue* 16 Septembre, 1803, à l'École de Strasbourg.)

Admitting, says M. Larrey, that, by a concurrence of fortunate circumstances, which are not always to be calculated upon, some patients escape the danger of the first symptoms, this proves nothing in favour of doing the operation afterwards; it must be seen what nature will do towards the event of the case.

If, at the end of twenty, or thirty days, the prognostic is as bad as it was previously, amputation cannot be avoided. Thus all the sufferings, which the patient has endured, have been undergone for nothing, and the operation will now be attended with considerable risk, inasmuch as the patient may lie in a dangerously weakened state.

If nature revives at all, no doubt, the success of the operation becomes more probable; but, in this case, the surgeon, instead of having recourse to amputation, should redouble his efforts to preserve the limb.

CASES DEMANDING AMPUTATION CONSEQUENTLY.

M. Larrey gives us the annexed information upon this subject.

First Case. A spreading Mortification. If the disorder be owing to an internal and general cause, it would then be rashness in the surgeon to amputate before nature had put limits to the disease. This kind of gangrene, according to M. Larrey, is distinguished from that, which is named *traumatic*, by the symptoms, which precede and accompany it. These symptoms are similar to those, which are observed in nervous ataxia, or adynamia. Here the operation ought to be deferred, and endeavours made to combat the general causes with regimen and internal medicines.

But when the gangrene is *traumatic*, the limb, says M. Larrey, should be immediately cut off above the disorganized part. Several facts, in support of this advice, are related by this experienced surgeon in his *Mémoire sur la Gangrene Traumatique*.

How contrary this advice to that inculcated by Sharp, Pott, and all the most eminent surgeons of the present time!

Second case. Convulsions of the wounded Limb. Amputation of the member, performed immediately the first symptoms of tetanus manifest themselves, interrupts all communication between the source of the disorder, and the rest of the body. The operation, according to M. Larrey,

unloads the vessels, and thus puts a stop to the tension of the nerves, and to the convulsions of the muscles. These first effects, he says, are followed by a general collapsus, which promotes the excretions, sleep, and the equilibrium of every part of the system.

The whole of the momentary pain, caused by the operation, cannot increase the existing irritation: besides the sufferings of tetanus render those of amputation, more bearable, and lessen their intensity, especially, when the principal nerves of the limb are strongly compressed.

Third case. Bad State of the Discharge. It often happens, that, in gun-shot wounds, complicated with fractures, notwithstanding the most skilful treatment, the discharge becomes of a bad quality; the fragments of bone lie surrounded with the matter, and have not the least tendency to unite; the patient is attacked with hectic fever, and a colliquative diarrhoea. Under these circumstances, life may sometimes be preserved by amputation.

Fourth Case. Bad state of the Stump. In hospitals, says M. Larrey, the cure of amputations is sometimes prevented by a fever of a bad character. The stump swells, the integuments become at first retracted, and then reverted and diseased a good way upward. The wound changes into a fungous ulcer, the cicatrization of which is hindered by the deep disorder of the bone, and the ulceration of the soft parts. The extremity of the bone projects. In order to remedy this last evil, it has been proposed to saw off the projecting part of the bone, and with this, even to amputate all the flesh beyond the level of the skin. M. Larrey condemns such practice as unnecessary and dangerous, and he recommends giving nature time to effect the exfoliation of the diseased projecting part of the bone, and heal the wound. The foregoing observations, relative to amputation in cases of gun-shot wounds, are taken from the latter part of the second volume of Larrey's *Mémoires de Chirurgie Militaire*.

GUN-SHOT WOUNDS OF THE ABDOMEN.

These cases may be divided into two kinds; one only penetrates the parietes of the belly, without hurting the contained parts; the other does mischief also to the viscera. The event of these two kinds of wounds is very different. In the first, little danger is to be expected, if properly treated: but, in the second, the success will be extremely uncertain, for, in many instances, nothing can be done for the

patient, and on other occasions, a good deal of art may be employed with advantage.

It is observed by Mr. Hunter, that such wounds of the abdomen as do not injure parts like the stomach, intestines, bladder, ureters, gall-bladder, large blood-vessels, &c. all which contain particular fluids, will generally end well. But, he adds, that there will be a great difference, when the ball has passed with immense velocity, as a slough will be produced; whereas, when the ball has moved with less impetus, there will not be so much sloughing, and the parts will, in some degree, heal by the first intention. Even when the ball occasions a slough, the wound frequently terminates well, the adhesive inflammation taking place on the peritoneum, all round the wound, so as to exclude the general cavity of the abdomen, from taking part in the inflammation. Such is often the favourable event, when the ball, besides entering the abdomen, has wounded parts like the omentum, mesentery, &c. and gone quite through the body. (*Hunter on Inflammation; Gunshot Wounds, &c. p. 543.*)

In gun-shot wounds of the belly, an extravasation is apt to take place on the sloughs becoming loose, about eight, ten, twelve, or fourteen days, after the accident; but, says Mr. Hunter, although this new symptom is in general very disagreeable, most of the danger is usually over, before it can appear.

In the article, *Abdomen*, we have detailed at large the general principles, which should be observed in the treatment of wounds of the belly, and, in order to avoid superfluous repetitions, suffice it in the present place to refer to that part of the dictionary.

For the purpose of illustrating the mode of treating gun-shot wounds of the abdomen, complicated with injury of the intestines and bladder, I shall lay before the reader the annexed observations from M. Larrey.

At the assault of Cairo, 1799, M. N. was shot in the abdomen with a ball, which divided the muscular parietes of this cavity on the right side, and a portion of the ilium. M. Larrey being upon the field of battle, gave him the first assistance. The two ends of the intestine were protruded, separated from each other, and inflated. The upper end was everted, in such a way, that its contracted edge, like the prepuce in a case of paraphimosis, strangulated the intestinal tube. The course of the fecal matter was thus obstructed, and the contents of the bowel accumulated above the constriction.

Although the patient's recovery was nearly hopeless, both from the nature of the wound, and from the debility and cholera morbus, which had already seized him in the short period, that he remained without succour in one of the intrenchments, M. Larrey was desirous of trying what could be done for so singular a case.

This eminent military surgeon first made four small cuts, through the constricted part of the intestine, with a pair of curved scissors, and put the bowel into its ordinary state. He passed a ligature through the piece of the mesentery, corresponding to the two extremities of the bowel. These he reduced as far as the margin of the opening, which he had taken care to dilate, and the dressings having been applied, he awaited events. The first days were attended with alarming symptoms, which, however, afterwards subsided. Those, which depended upon the loss of the alimentary matter, successively abated: and, after two months, the ends of the ilium were opposite each other, and disposed to become connected together. M. Larrey seconded the efforts of nature, and dressed the patient with a tampon, or sort of tent, that was occasionally employed for two months. The patient was then discharged from the hospital quite cured.

In several instances, say M. Larrey, the sigmoid flexure of the colon, was injured, and yet the wounds were cured without any fecal fistulæ. At the siege of Acre, three examples occurred; and, at that of Cairo, two. M. Larrey took care to dilate well the entrance and exit of the ball. Clysters, made of a decoction of linseed, and emollient beverages were frequently exhibited; and the patients were kept on low diet, and in the most quiet state.

M. Larrey informs us, that the gun-shot wounds of the bladder, which occurred in Egypt, had for the most part a favourable termination. The most remarkable case was that of Francis Chaumette, a light horseman, who was wounded at the battle of Tabor. The ball passed across the hypogastrium, about one finger-breadth above the pubes, to the point of the left buttock, which corresponds to the ischiatic notch. The direction of the wound, and the issue of feces and urine from the two orifices, could not let M. Larrey doubt, that the bladder and rectum were injured. M. Milioz, who directed the surgical affairs of the division of the army under Kleber, diligently pursued the same kind of treatment which he had seen M. Larrey adopt at the siege of Acre. During the suppurative stage, the

patient was affected with fever; and, after the sloughs were detached, the discharge was very copious. A catheter, that was passed into the bladder, prevented an extravasation of the urine, and, at the same time, promoted the union of the wound of that viscus. This was healed the first, and the patient upon his return to Cairo, was quite cured.

M. Larrey has recorded several other interesting cases of wounds of the bladder, to which I must content myself with referring. (See *Mémoires de Chirurgie Militaire*, Tom. 2, p. 160—165. Tom. 3, p. 340, &c.

This experienced military surgeon offers the following as a succinct account of the results of such injuries, and the treatment, which is proper.

During the first four and twenty hours very little urine escapes from gun-shot wounds of the bladder, in consequence of the swelling, which almost instantly affects the lips of the wound. When the bladder is full, this fluid is only discharged at the moment of the accident, and only from the wound, by which the ball has made its exit. An extravasation is prevented by the thick slough, which fills all the track of the injury, and it is not till the deadened parts become loose, that any effusion can happen. Hence, it is of the highest importance to have an elastic gum catheter introduced into the urethra, where it should be kept, and the instrument should be large enough to fill exactly this canal; for, if at the period, when the sloughs are detached, the urine has not a ready passage outward, it passes through the wound, and is extravasated the more readily, inasmuch as the separation of the sloughs has occasioned many openings, by which the fluid may insinuate itself into the cellular membrane. Hence, gangrenous mischief and death.

After having well dilated the wounds, in order to facilitate the escape of the urine, which might lodge in the track of the ball, a large elastic gum catheter should be introduced and left in the bladder, taking care to withdraw it, and pass in a clean one every two or three days, so that no incrustations may occur. Emollient clysters, and acidulated demulcent drinks are to be prescribed, and the patient is to be kept upon a very low regimen, and in the most quiet state. The dressings are to be simple, and cleanliness observed. (*Op. cit. T. 2, p. 165—170.*)

GUN-SHOT WOUNDS OF THE THORAX.

Wounds of the lungs, abstracted from other mischief, are now well known not

to be always fatal. Mr. Hunter had some reason to believe, that wounds of the lungs, made with balls, were generally less dangerous, than such as were made with sharp-pointed instruments; for, he had seen several patients recover, after they had been shot through the lungs, while other persons died of very small wounds of those organs, done with swords and bayonets. Perhaps, one cause of this fact may be owing to the circumstance of gun-shot wounds bleeding less, than other wounds, so that there is not so much danger of blood being effused in the cavity of the chest, or the cells of the lungs. The indisposition of the orifice of a gun-shot wound to heal up too soon, is also another circumstance, that must lessen the hazard, as whatever matter happens to be extravasated has thereby an opportunity of escaping.

But, from what has been stated, it must not be inferred, that gun-shot wounds of the lungs are not accompanied with a serious degree of danger. Frequently, the patient expires instantly, being suffocated in consequence of the hemorrhage from those organs; for, though it be true, that gun-shot wounds generally do not bleed much, when the injured vessels are under a certain size, yet, the contrary is the case, when the wounded vessels are like those, which exist towards the root of the lungs. Gun-shot wounds of the chest also often prove fatal by the inflammation, that is excited within this cavity.

It cannot be supposed, that adhesions take place round the opening of a gun-shot wound in the chest, because the lungs collapse, and become considerably distant from the pleura, whenever a free communication is established between the atmospheric air in the cavity of the thorax. However, as adhesions are extremely common between the outer surface of the lungs, and the inner surface of the pleura costalis, they must, in many instances, exist before the receipt of a wound, and of course, prevent the usual collapse of the lungs.

The general symptoms, and also the treatment of wounds of the chest, are detailed in the article, *Thorax*. Suffice it in the present place to observe, that, when a patient has been shot in the chest, the most important indication is to prevent and subdue inflammation of the lungs and pleura. In few other cases, can repeated and large bleedings be so advantageously practised. The patient is also to be kept on the lowest diet, take febrifuge medicines, and, if he be much disturbed with a cough, the spermaceti mixture with opium. Here, there will

not be so much danger of an extravasation of blood, as in stabs, and, even if an effusion of that fluid were to happen within the cavity of the pleura, the opening would generally be sufficient for its escape, and it would not be so frequently found necessary to dilate the wound, or make a new opening, as when the injury has been inflicted with a sharp-pointed weapon.

When matter forms in the thorax in consequence of gun-shot wounds, the opening will generally suffice for its escape; but, should the collection of pus be confined and occasion dangerous symptoms, the external wound must either be enlarged, or a new incision be practised, according as circumstances may indicate. The mode of making an opening into the chest is considered in the article, *Paracentesis*.

For information on gun-shot wounds, consult the works of Ambrose Paré; *Runby on the Cure of Gun-shot Wounds*, 8 vo. London, 1744. *Observations sur des Plaies d'armes à feu, compliquées, de fracture, aux articulations, des extrémités, ou au voisinage de ces articulations, par M. Boucher: in Mém. de l'Acad. de Chirurgie, Tom. 5, p. 279, Edit. in 12mo. Observations sur des Plaies d'armes à feu compliquées surtout de fracas des os, par M. Boucher, in opere cit. Tom. 6, p. 109, &c. Edit. in 12mo. Observations sur les Plaies d'armes à feu: 1. Sur un coup de fusil, avec fracas des deux mâchoires; par M. Canuac. 2. Sur une Plaie d'arme à feu traversant la Poitrine d'un côté à l'autre; par M. Gerard. 3. Sur une Plaie d'arme à feu, pénétrante depuis la partie antérieure du pubis, jusqu'à l'os sacrum; par M. Andouillé. 4. Sur une Jambe écrasée par un Obus, ou petite bombe, par M. Canuac. 5. Sur une Plaie à la partie inférieure et interne de la Jambe faite par un éclat de Grenade, sans fracas d'os; par M. Canuac. 6. Précis de plusieurs Observations sur les Plaies d'armes à feu en différentes parties par M. Bordenave. All these papers are inserted in *Mém. de l'Acad. de Chirurgie, Tom. 6, in 12mo*, and in *Tom. 11 of the same edition*, are inserted *Mémoire sur le traitement des Plaies d'armes, à feu, par M. de la Martinière*, and *Mémoire sur quelques particularités concernant les Plaies faites par armes à feu, par M. Vacher*. M. Faure's memoir relative to amputation in cases of gun-shot wounds may be seen in *Tom. 8, of the Recueil des Pièces qui ont concouru pour le Prix de l'Acad. de Chirurgie, Edit. in 12mo*.*

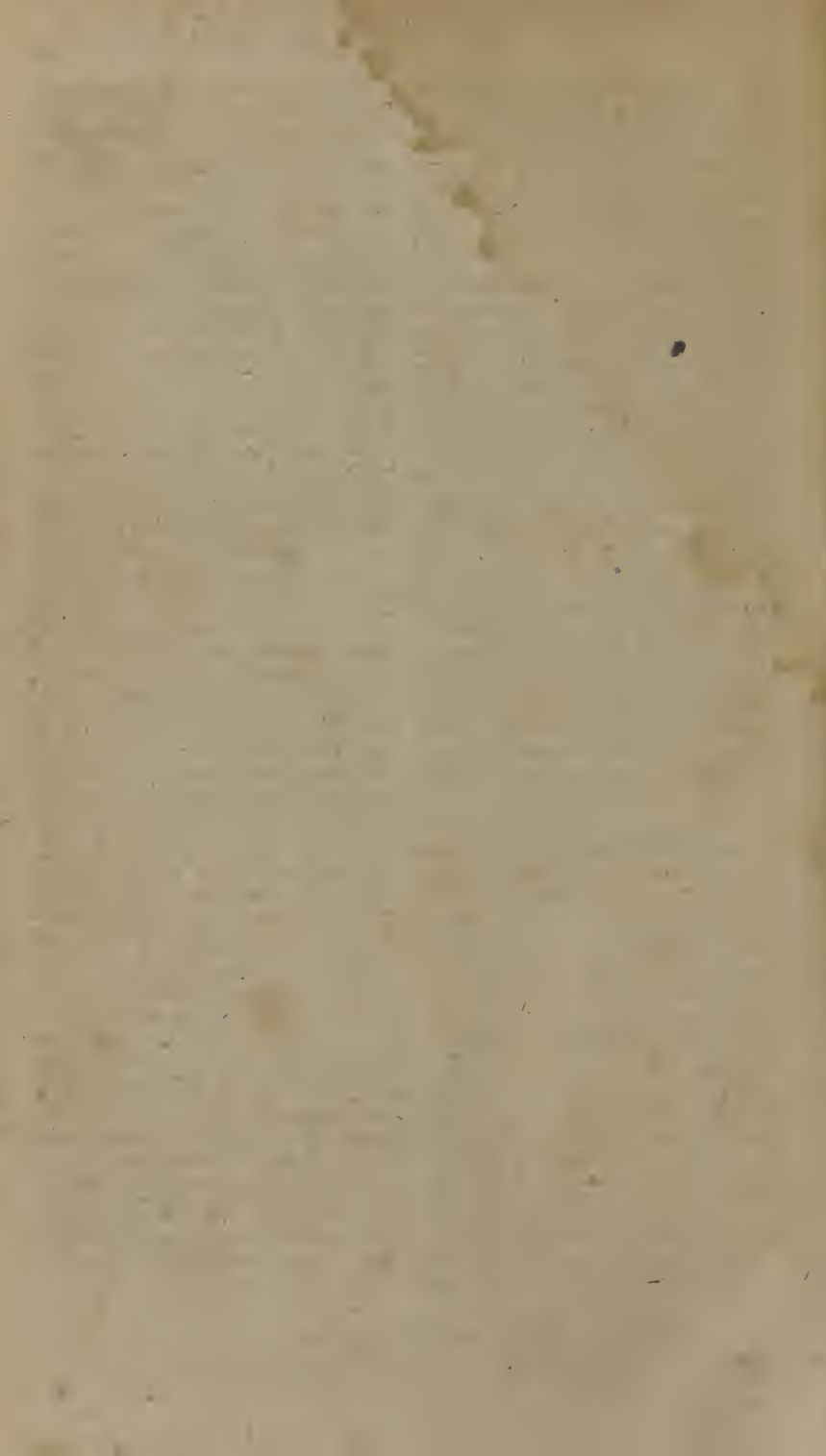
John Hunter's Treatise on the Blood, Inflammation, and Gun-shot Wounds. Richter's Anfangsgrunde der Wundarzneykunst, Band 1. Schmucker's Chirurgische Wahrnehmungen. Richerand's Nosographie Chirurgicale, Tom. 1, p. 217, &c. Edit. 2. Chevalier's Treatise on Gun-shot Wounds, Edit. 3. Levéillé's Nouvelle Doctrine Chirurgicale, Tom. 1, Chap. 8, p. 436, &c. Encyclopédie Méthodique, Partie Chirurgicale, art. Plaies d'armes à feu. Larrey's Mémoires de Chirurgie Militaire.

GUTTA SERENA. A term, said to have been first applied by Actuarius to amaurosis, or the species of blindness arising from an insensible state of the retina, or optic nerve. (See *Amaurosis*.)

Under this latter head, I have treated of the subject so fully, that it is not my intention to expatiate upon it here. However, as there is one particular case, not noticed in the article, *amaurosis*, I must take the present opportunity of mentioning it.

According to the observations of Mr. Ware, persons, who labour under this disorder, are not unfrequently subject to a particular kind of ophthalmy, which occasions a most excruciating pain, and seems to require a peculiar mode of treatment. At the close of the remarks published on the ophthalmy, *fistula lachrymalis*, &c. by Mr. Ware, this gentleman has introduced a case of this kind, which was greatly relieved by making a puncture through the tunica sclerotica into the ball of the eye with a grooved needle, somewhat larger than a common sized couching needle, nearly in the part, where this instrument is introduced in the operation of depressing the cataract. Through the groove of the instrument, a watery fluid immediately issued, which was not unlike that which Mr. Ware has several times seen effused between the choroid coat and retina after death, in cases of gutta serena. After the pain of the operation had ceased, the patient became quite easy, and the inflammation soon subsided. Since this example, Mr. Ware has performed a similar operation in a considerable number of resembling instances, and in several of them the proceeding has been attended almost immediately with manifest good effects.

For further information on this subject, the reader must refer to Ware on the operation of largely puncturing the capsule of the crystalline humour, &c. and on the *Gutta Serena*, accompanied with pain and inflammation, 1812.



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